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AEROPLANE

HISTORY IN THE AIR SINCE 1911

SPECIAL ISSUE ★ COLD WAR

V-FORCE

Preparing for the nuclear conflict that never came

DATABASE: ISLANDER AT 60

Britten-Norman's masterpiece in depth

REVEALED: NEW UK MUSEUM

Plans for Dunsfold attraction

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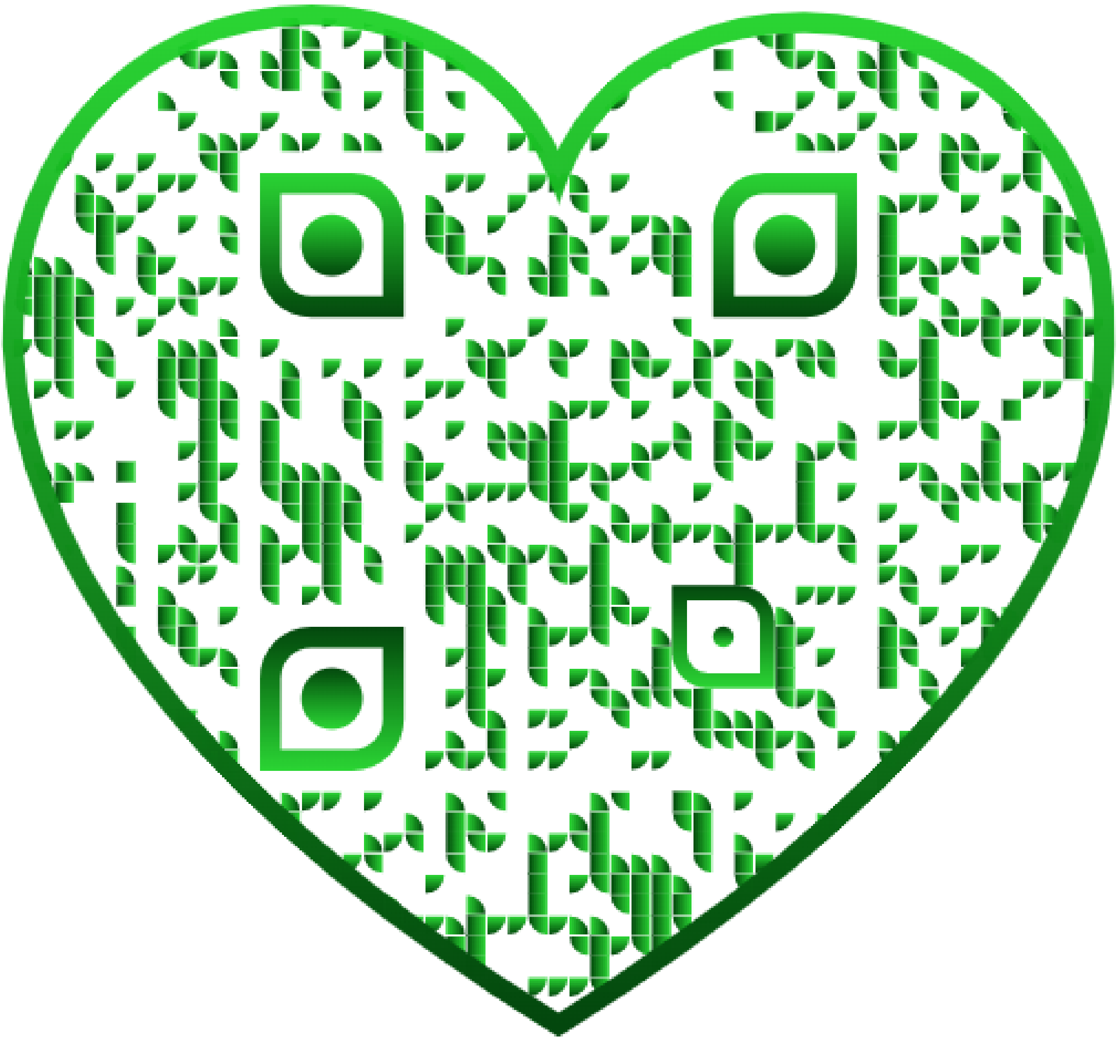

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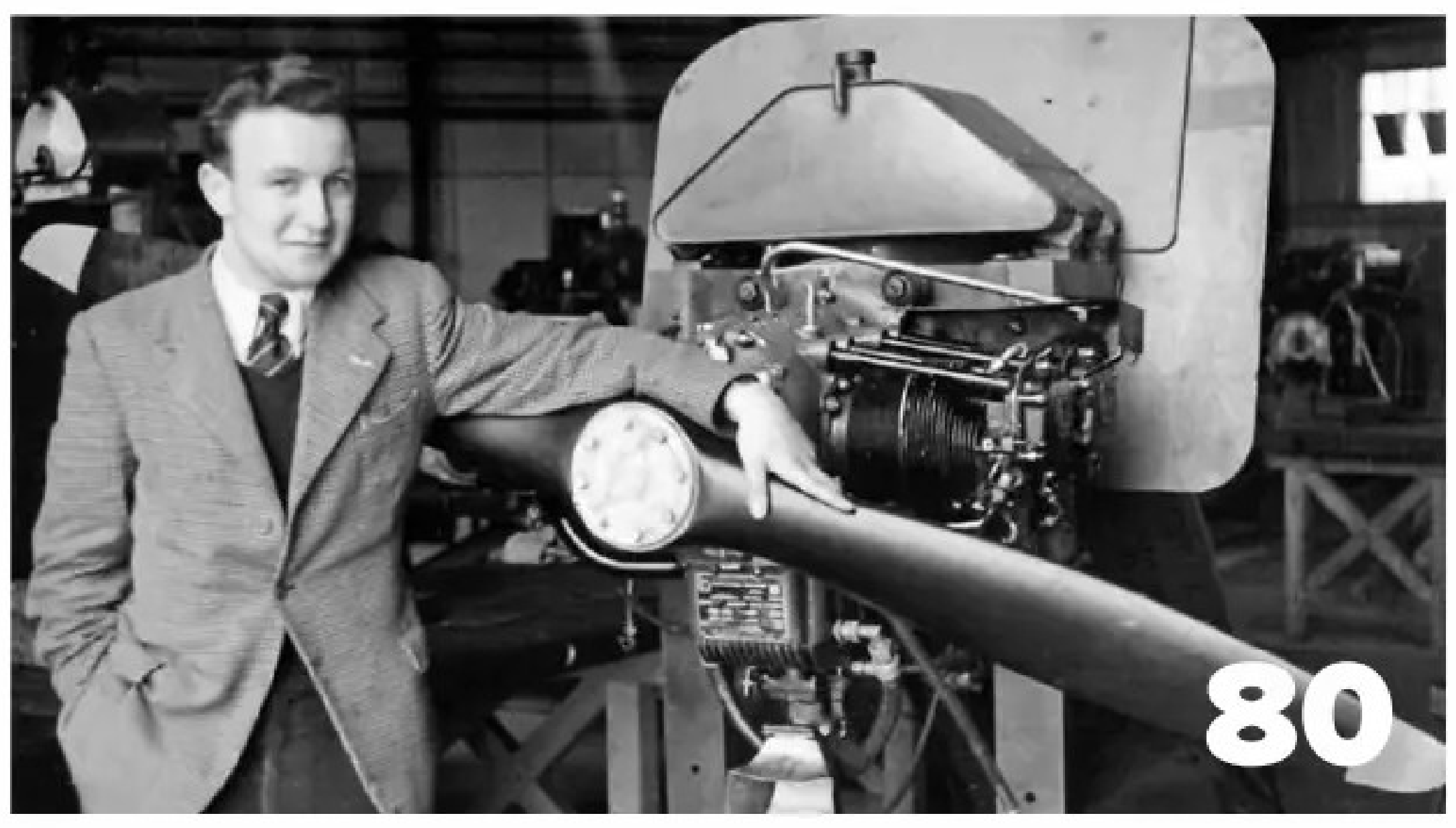

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DATABASE
BRITTEN-NORMAN ISLANDER
CHUTE PLATFORM

19 IN-DEPTH PAGES

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COVER IMAGE: Vulcan B1 XA902, in the classic anti-flash white scheme, lands at Hucknall where it was used for Rolls-Royce Conway testing. GETTY/ROLLS-ROYCE

From the Editor

CONNECT WITH *AEROPLANE*...
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I'm sure I'm not alone in having committed a double-take at the announcement heralding the investment by BAE Systems in the RAF Museum's redevelopment of its Midlands site at Cosford. "Highlights", it said, of the new exhibition on the RAF from 1980 to the present day in the refurbished Hangar 1, will include "a 1:1 model of the future Tempest combat air system". Excellent exhibit for an airshow, not so for a major museum, and especially not when genuinely historic airframes are being put up for disposal. But there is no doubt there now exists a discernible shift of interest towards more recent aspects of aviation history, even if the Second World War remains most prominently embodied within the ranks of airworthy representatives. Perhaps this explains why, with the current changes to IWM Duxford's AirSpace building, the country will end up with two dedicated Cold War exhibitions, the existing one at Cosford being the other. It's a natural consequence of the passage of time, and a welcome development in terms of bringing to the fore stories that have hitherto not been told as often as their 1939-45 equivalents, if at all.

Having pored over the very extensive files at the National Archives on the 'V-bomber' dispersal plan, in researching the article that appears inside I came across a fascinating piece from the RAF publication *Air Power Review*: a transcript of a 2009 witness seminar at King's College London on Bomber Command's role in the Cuban missile crisis. In it, Air Cdre Norman Bonnor, a navigator radar on No XV Squadron's Victors back in 1962, said that when the National Cold War Exhibition opened at Cosford, "in the booth about the Cuban missile crisis, the Royal Air Force [initially] got no mention whatever. You would not know that we had been there". Marshal of the Royal Air Force Sir Michael Beetham, who had been at Bomber Command HQ, replied, "I think that it has changed. It told me that it had. When I saw it, I raised exactly the same point. The museum was using official records and, as we have heard, there is little mention in the documentation about the efforts of Bomber Command. It has seemed to have been ignored. Why, I do not know."

It is indeed hard to find details in those records, whether because of the secrecy that surrounded the subject, simple omission or other factors. Even Prime Minister Harold Macmillan had little to say in his diaries. But now a wide range of sources presents a fuller picture, to the extent of the topic deserving a book of its own. It's just one of the Cold War stories we so enjoy presenting in our annual special.

> ***"Even Macmillan had little to say in his diaries about Cuba"***

Hope you'll excuse the change to our '*Aeroplane* meets...' feature this month. As with the greatly missed Richard Grace towards the end of last year, we felt the best way to pay tribute to the late Desmond Penrose was to take a look back to the interview we did with him in 2020, on this occasion combined with fresh detail from his logbooks and papers, as bequeathed to Loughborough University where he studied in the late 1940s and early '50s.

Incidentally, Desmond knew Richard's late father Nick Grace, who was a fellow Loughborough graduate and let Desmond fly both the Reid and Sigrist Desford and his two-seat Spitfire, ML407. There's also a link between Nick Grace and someone else whose passing we report inside: Walter Eichhorn, the very popular German warbird pilot, for both of them flew Hispano Buchóns during the making of London Weekend Television's 1988 serial *Piece of Cake*. There's no end to the connections across the historic aircraft scene.

Ben Dunnell

AEROPLANE ESTABLISHED 1911

Aeroplane traces its lineage back to the weekly *The Aeroplane*, founded by C. G. Grey in 1911 and published until 1968. It was relaunched as a monthly in 1973 by Richard T. Riding, editor for 25 years until 1998.

CONTRIBUTORS THIS MONTH

PIERRE-ALAIN ANTOINE

A retired Armée de l'Air colonel, Pierre-Alain notched up 6,200 flying hours in the F-100, Mirage IIIE, Mirage IVA and Jaguar. He then served as director of the air arm's display teams, including the Patrouille de France, and of the POLYGONE electronic warfare tactics range on the Franco-German border, before becoming an EW operational adviser for Thales in France. Pierre-Alain is now a consultant and historian.

PETER DYE

Peter is a graduate of Imperial College and Birmingham University. He served in the RAF for more than 35 years and was awarded the OBE for his work during the first Gulf War, retiring as an air vice-marshal. He was director general of the RAF Museum from 2008-14, was an honorary research fellow at Birmingham University, a visiting lecturer at Wolverhampton University, and a Verville Fellow at the National Air and Space Museum, Washington DC. Peter's latest book, *The Birth of British Airpower, Hugh Trenchard, the First World War and the RAF*, is published by Pen & Sword.

DAVID HALFORD

"Jack Parham often served in the same theatres as my father", reflects David. "Both were in France after war broke out and returned unscathed from Dunkirk, only to take part in the North Africa landings in Algeria. The advance to Tunisia helped Parham crystallise his view that spotter work was best done by gunners flying light aircraft, also trialled in Italy, where both men found themselves next. Parham was called back to help D-Day planning, with my father returning from the USA to France post-D-Day, advancing through Belgium and the Netherlands, and the final assault into Germany, where Parham acted as 'Monty's Gunner' for the 2nd Army."

MATTHEW WILLIS

The author of this month's Database on the Britten-Norman Islander and Defender lives in Southampton, across the Solent from B-N's home at Bembridge where Islander production has returned, beneath skies where B-N aircraft were a common sight and may soon be again. He has written a number of books on World War Two and pre-war aircraft — the latest, on the Fairey Fulmar naval fighter, was released in June 2025.

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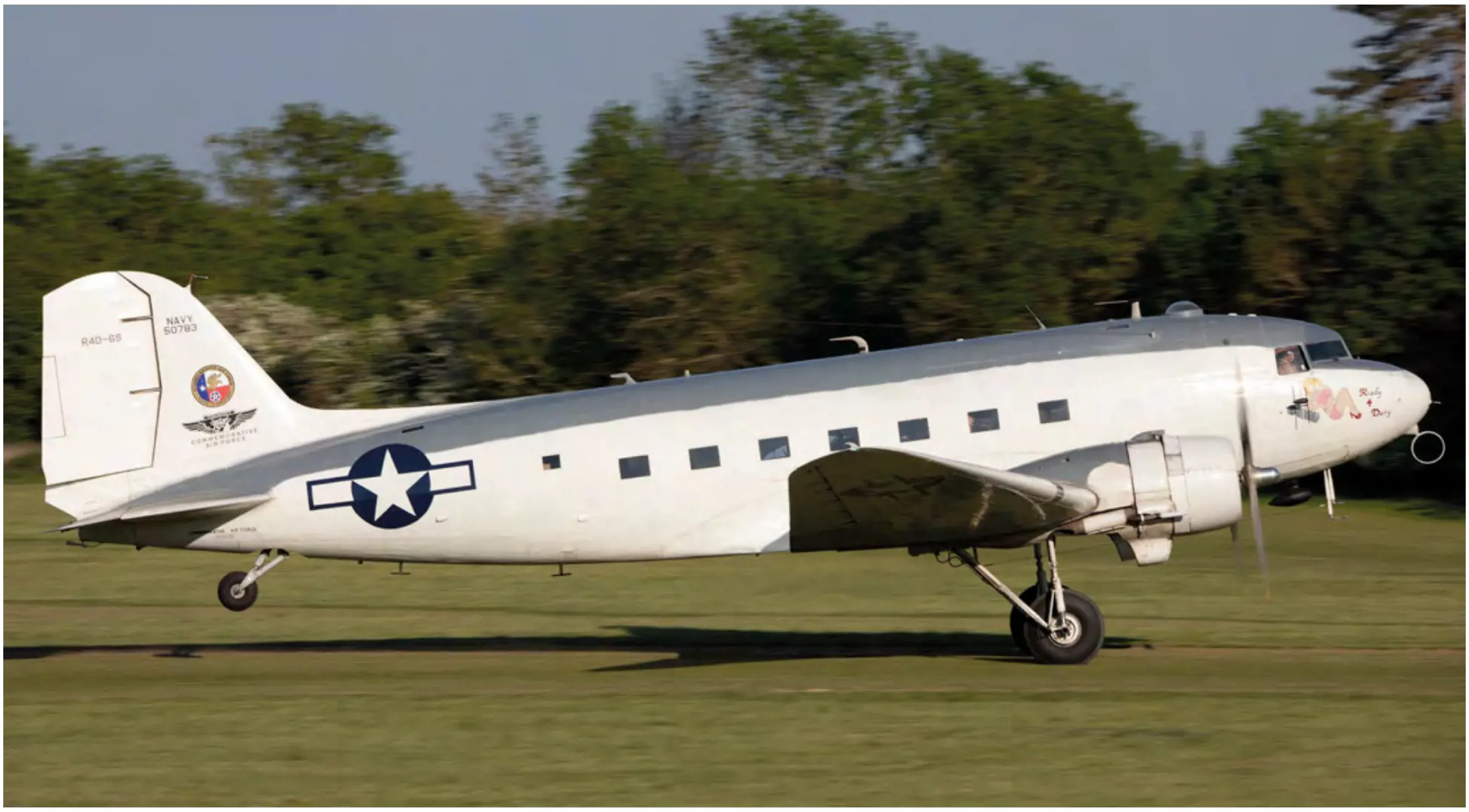
NEWS EDITOR: TONY HARMSWORTH
E-MAIL TO: tony.harmsworth@keypublishing.com
TELEPHONE: +44 (0)7791 808044
WRITE TO: *Aeroplane*, Key Publishing Ltd,
PO Box 100, Stamford, Lincolnshire PE9 1XQ, UK

Trans-Atlantic R4D makes waves in UK



The Commemorative Air Force R4D-6S leaving Old Warden after being on static display at the Season Premiere show on 11 May. In appearing there, *Ready 4 Duty* became the 11th different C-47/DC-3 to have landed at the Bedfordshire aerodrome, all of them since 2019. BEN DUNNELL

The Commemorative Air Force's Douglas R4D-6S BuNo 50783/N151ZE *Ready 4 Duty* has been a welcome trans-Atlantic participant in the early-season airshow scene in the UK, following its arrival at Duxford on 28 April from its base in Dallas, Texas to start the Navy to Victory Tour.

The US Navy variant of the C-47 transited via the Military Aviation Museum at Virginia Beach, followed by Waterbury Oxford Airport, Connecticut, Presque Isle in Maine, Goose Bay, Narsarsuaq in Greenland, and then from Reykjavík, Iceland to Duxford, favourable tailwinds obviating the need to make landfall as planned at Wick, Scotland. Visits were made to Eindhoven and Gilze-Rijen air base in the Netherlands for Dutch Liberation Day on 5 May, followed by a trip to Guernsey for the Channel Islands Liberation Day on 9 May.

During the flight from Dallas to the US west coast on 17 April, the R4D stopped at Maxwell Air Force Base, Alabama, where 2,000 RAF airmen received instruction with Southeast Training Command during the war. Seventy-eight RAF airmen killed in training accidents flying from Montgomery are buried at the city's Oakwood Cemetery. Chris Volpe, wing leader of the Dallas/Fort Worth Wing of the CAF which operates the R4D, liaised with members of the CAF in Birmingham, Alabama and Montgomery, along with personnel and family members from the Air Command and Staff College at Maxwell AFB, to take rubbings from each of the headstones in Oakwood Cemetery for transportation to the UK in the aircraft as part of a CAF 'Bringing the Boys Back Home' initiative.

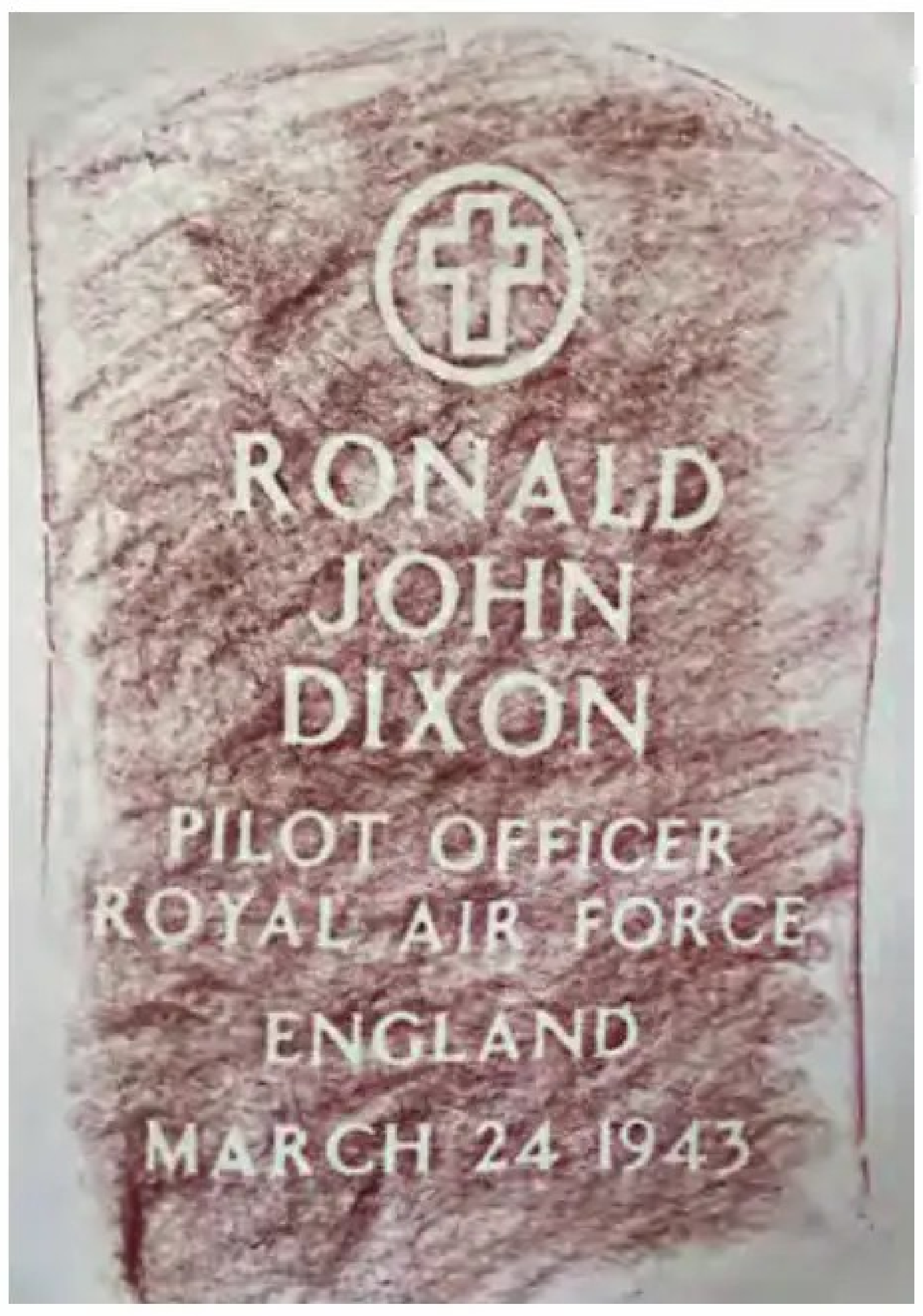
USAF Lt Col Matt Ziemann, Air Command and Staff College Department of Leadership instructor at Maxwell AFB said, "It's important to remember and honour the sacrifice of those who died in service not only to their country, but our allies and partners in the shared fight for freedom against tyranny. This effort highlights the continuing special relationship we have with the United Kingdom.

Ready 4 Duty

Three of the R4D crew at Duxford on 20 May: left to right, CAF Dallas/Fort Worth Wing leader Chris Volpe, engineer Robert Collier, and Glenn Olsen, one of 20 qualified pilots who fly the R4D. TONY HARMSWORTH

"For the families who have never had a chance to come here to Alabama, this is a way to symbolically bring their family home. We're doing what we can to ensure airmen who died training in a country not their own are not forgotten. This is about honouring sacrifice and preserving memory."

Built during 1944, the CAF R4D was modified to R4D-6S configuration for air-sea warfare training, fitted with the latest radar equipment, including a large radome under the fuselage — the patch covering the installation is still visible — and various other antennae. External racks for depth charges were located under the centre-section, the machine being assigned to the US Navy Atlantic Special Service Squadron where it carried out airborne search radar and sonar evaluation in addition to training airborne specialists and operators. It served in the Caribbean, from Texas to Guantanamo, Cuba, in South America as far down as Rio de Janeiro, across the South Atlantic to Dakar, in the eastern Atlantic up to Baffin Bay and northern Newfoundland, and across the northern hemisphere to Greenland and Iceland. Post-war it was assigned to Naval Headquarters Berlin, and later flew as a 'smoke-jumper' on firefighting duties for the US Forestry Service.



One of the 78 rubbings taken from RAF trainee aircrew graves at Montgomery, Alabama, and flown to the UK in the R4D. TONY HARMSWORTH

Following acquisition by the CAF, the R4D flew to the UK in 1985 to appear at the International Air Tattoo for the 50th anniversary of the DC-3 fly-in at Fairford. 40 years on, it will be back at Fairford for the Royal International Air Tattoo from 18-20 July.

Anson arrives at Avro Heritage Museum

On 22 May, the Avro Heritage Museum at Woodford, Stockport received Anson C19 TX214 from the RAF Museum Midlands at Cosford, a significant addition to the museum's collection. The aircraft has been permanently gifted by the RAFM.

Originally built at the Avro factory at Yeadon — now Leeds Bradford Airport — between January and August 1946, it is recorded as flying with No 16 Ferry Unit at St Mawgan that September. After shuffling between various other units, in December 1951 it went to No 31 Squadron at Hendon, which was renamed the Metropolitan Communications Squadron on 1 March 1955.

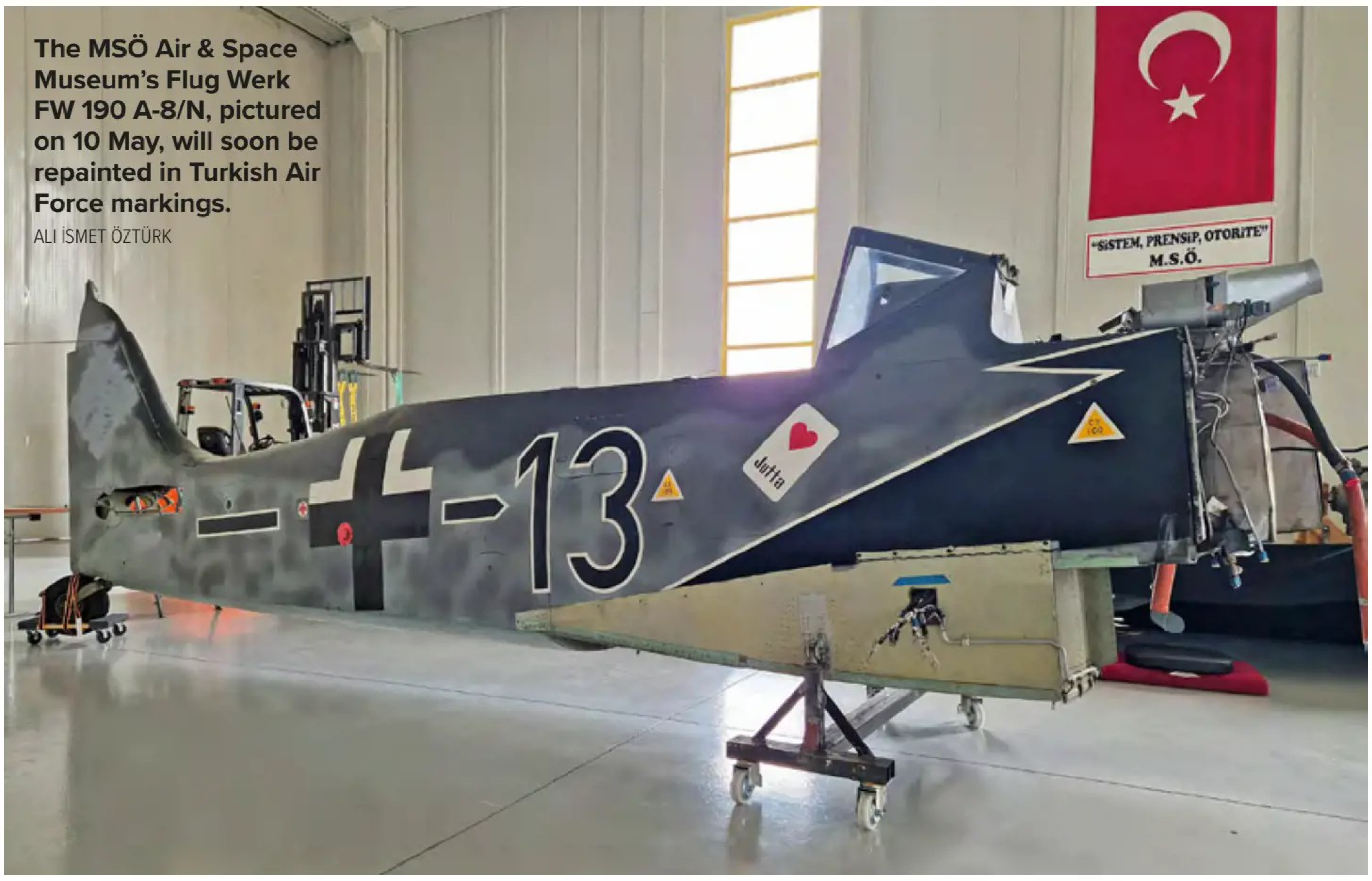
Coded CB-T, by December 1955 TX214 was one of six Ansons on the unit's strength, alongside four de Havilland Devons and four Chipmunks. It was operated on communications, air experience and continuation training duties, becoming the last aircraft to fly out of Hendon on 7 November 1957, the Metropolitan Communications Squadron having moved to Northolt. On 14 December 1962 TX214 passed to the Maintenance Command Communications Squadron at Andover, making its final flight to the RAFM store at Henlow on 4 July 1963, the allocation no doubt being due to its Hendon provenance.

Anson TX214 arrives at the Avro Heritage Museum on 22 May, following the road trip north from Cosford. AHM

In December 1978 TX214 was moved by road to the then Aerospace Museum at Cosford.

Over the coming months the aeroplane will be refurbished and will be available for viewing on event days at the Woodford museum. The AHM has submitted a planning application to expand its exhibition space with a large aircraft hall, which will be used to display the Anson alongside other airframes currently held in storage including Shackleton AEW2 WR960.

Flug Werk FW 190 arrives in Turkey



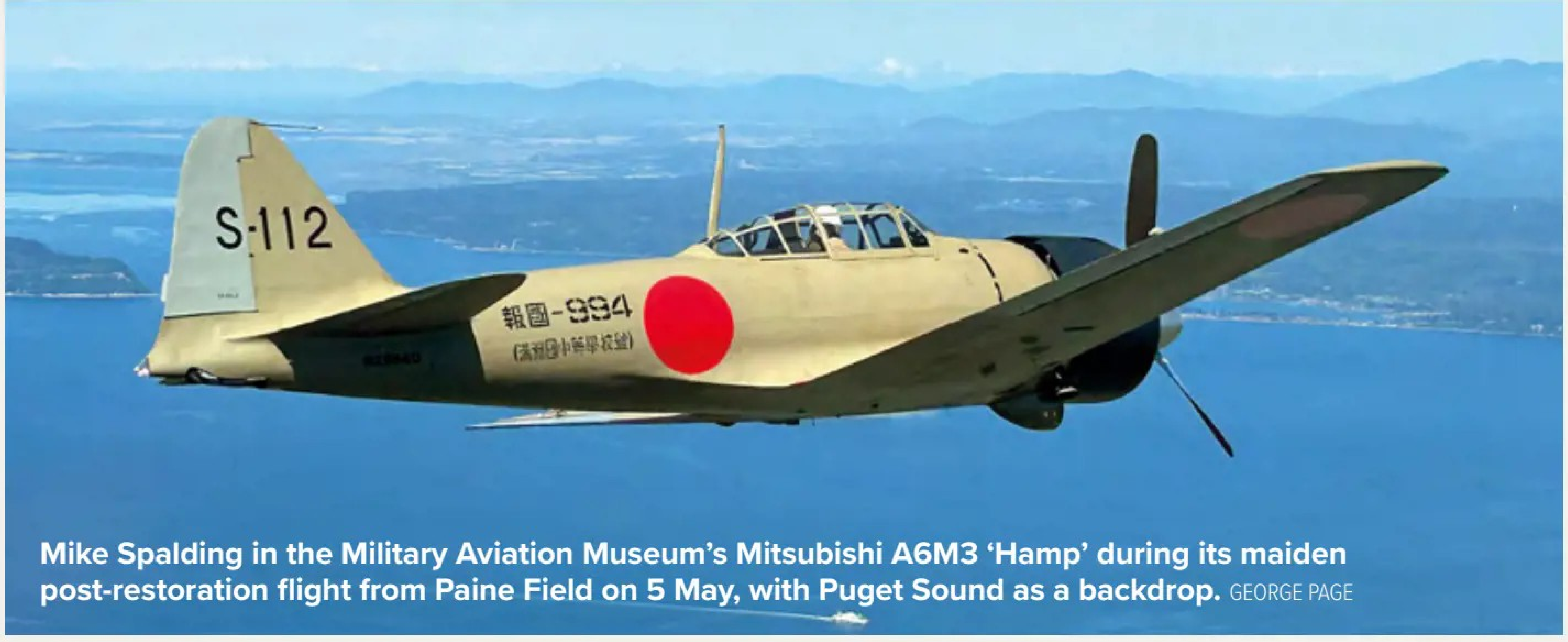
The MSÖ Air & Space Museum's Flug Werk FW 190 A-8/N, pictured on 10 May, will soon be repainted in Turkish Air Force markings. ALI İSMET ÖZTÜRK

A Flug Werk FW 190 A-8/N arrived at the MSÖ Air & Space Museum facility at the Sivrihisar Aviation Center in Eskisehir, north-western Turkey on 8 May following its acquisition by Ali İsmet Öztürk from Dan Kirkland in California.

The fighter is currently painted in the markings of 101-victory Luftwaffe ace Josef 'Pips' Priller's mount as it looked when he strafed Sword Beach on 6 June 1944, but it will soon be reconfigured to represent one of 72 examples of the Focke-Wulf Fw 190 A-3a delivered to Turkey between July 1942 and March 1943 in an exchange deal that saw crucial minerals, including chromium and high-grade iron, exported to the Third Reich. They were operated by the 5th Fighter Regiment at Eskisehir air base, protecting the capital Ankara and the central part of the country. Highly popular with Turkish pilots, the last examples were not retired until early 1949.

The MSÖ machine is based on one of the Shvetsov ASh-82-powered FW 190 replicas built by Flug Werk in Germany, but incorporates some original components from an Fw 190 A-5 obtained by Dan Kirkland from France, the project being put together by GossHawk Unlimited in Casa Grande, Arizona. The MSÖ Air & Space Museum already displays the former Old Flying Machine Company P-51D 44-73149 *Ferocious Frankie*, Spitfire IX TE517 — which now wears Turkish Air Force markings to represent the 196 examples of the mark which were operated in Turkey until 1954 — and a 1940-vintage Douglas DC-3, N3291 *Turkish Delight*, which was formerly flown by the Switzerland-based Super Constellation Flyers organisation with sponsorship from the Breitling watch company.

MAM 'Hamp' airborne in Washington



Mike Spalding in the Military Aviation Museum's Mitsubishi A6M3 'Hamp' during its maiden post-restoration flight from Paine Field on 5 May, with Puget Sound as a backdrop. GEORGE PAGE

The Virginia Beach-based Military Aviation Museum's Mitsubishi A6M3 'Hamp' made its maiden post-restoration flight at Paine Field, Everett, Washington on 5 May with MAM chief pilot Mike Spalding at the controls.

Based on the substantial remains of two Imperial Japanese Navy A6M3s which were recovered from Maloelap Atoll, Taroa, in the Marshall Islands during 1991, the fighter has been restored to fly by Legend Flyers at Paine Field. The forward fuselage and wings came from A6M3 Type 32 serial 3148, recovered 35 years ago by John Sterling of Boise, Idaho, with the rear fuselage and tail coming from 3145. It has been fitted with a Pratt & Whitney R-1830-92 engine in place of the original Nakajima Sakae unit, both powerplants being two-row, 14-cylinder air-cooled designs.

The Allied 'Hamp' codename was given to this clipped-wing version of the Zero, but after it was discovered to be just a modified variant of the standard Zero, the 'Hamp' appellation was dropped in favour of 'Zeke 32'.

Biggin Spitfire I flies from old base

The immaculate Spitfire I, P9372/G-CLIH, on the apron at its wartime base, Biggin Hill, prior to the first flight. BHSF

Test pilot Pete Kynsey tucks the undercarriage up during P9372's maiden flight on 22 April. BHSF

Supermarine Spitfire I P9372/G-CLIH made its first post-restoration flight at Biggin Hill on 22 April, following rebuild at the Biggin Hill Spitfire Factory. Pete Kynsey was at the controls of the 85-year-old fighter, which had not been airborne since it became a combat loss during the summer of 1940.

Now owned by Dutchman Frits van Eerd, at 17.30hrs on 9 September 1940, while being flown by Plt Off William Watling from the Biggin Hill-based No 92 Squadron, P9372 was shot down during an engagement with Luftwaffe Messerschmitt Bf 109 Es. Watling managed to bail out, P9372 crashing into a field at East Guldeford near Rye, East Sussex. He had suffered serious burns to his face and hands, and only after several months of treatment at the Queen Victoria Hospital, East Grinstead by Sir Archibald McIndoe and his team was the 20-year-old, Middlesborough-born pilot able to return to No 92 Squadron. Watling would die on 7 February 1941 in Spitfire I R6924, which flew into high ground near Deal, Kent in bad visibility during a weather check sortie.

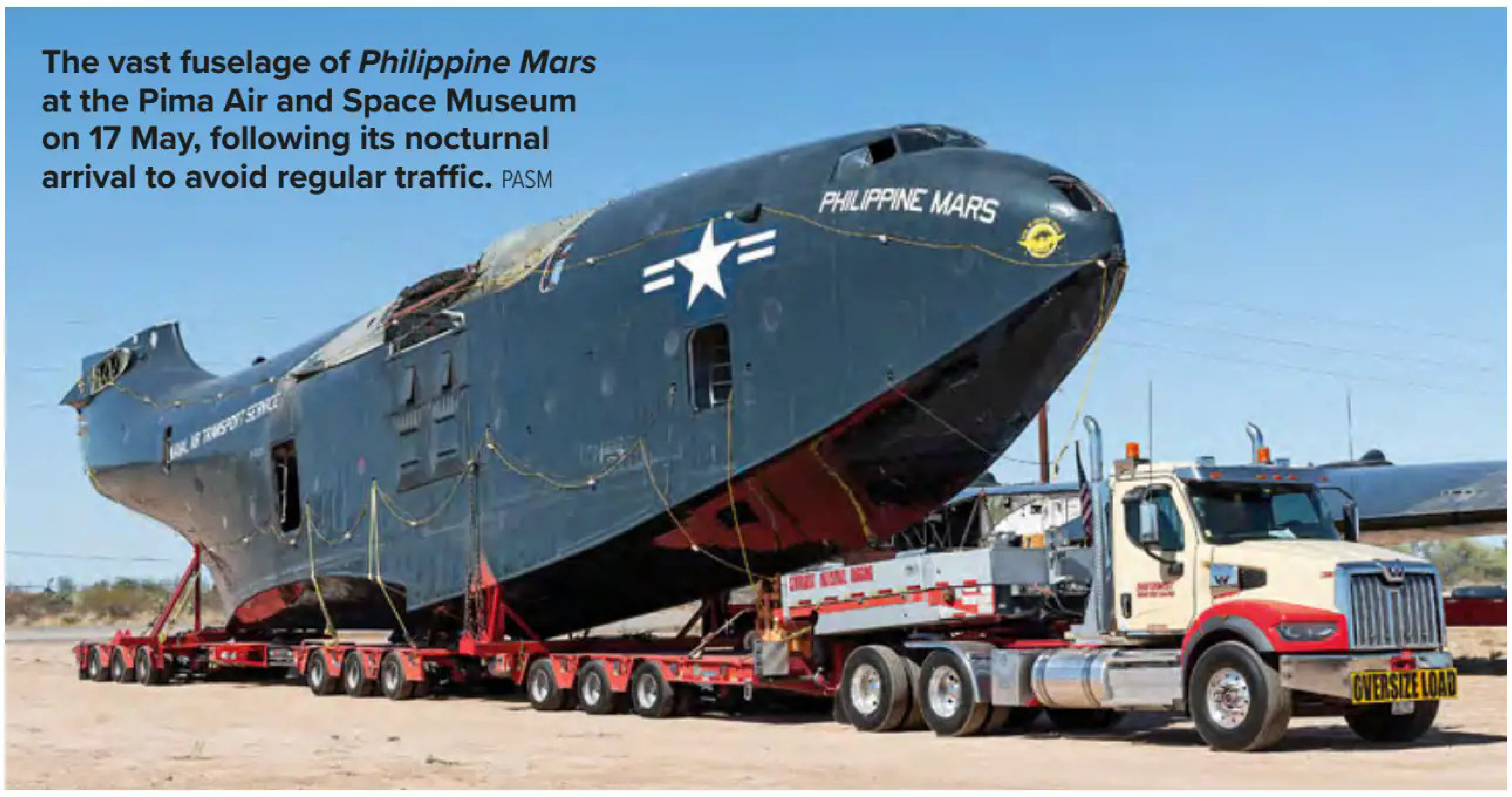
Built by the Vickers-Armstrongs 'shadow factory' facility at Castle Bromwich, Birmingham and first flown on 22 February 1940, P9372 is a Dunkirk veteran, having been flown by Plt Off Tony Bartlett during the evacuation from the northern French beaches. The aeroplane sustained damage during its involvement in Operation 'Dynamo'. It is also believed to have been flown by another especially famous No 92 (East India) Squadron pilot, Plt Off — later Sqn Ldr — Geoffrey Wellum DFC, author of the acclaimed memoir *First Light*.

Elvington Victor back to camouflage

The Yorkshire Air Museum at Elvington is repainting Handley Page Victor K2 XL231 in the camouflage scheme it wore when engaged in 1982's Operation 'Corporate' in the Falkland Islands. The aircraft, which arrived at Elvington in 1993 following its acquisition by Andre Tempest, had been in the later hemp livery since the mid-1980s. With support from Kaefer in providing the scaffolding and Bagnalls in performing the painting itself, work started on 6 May and is set for completion by the museum's Cold War Wheels event on Sunday 15 June, where XL231 is due to be publicly unveiled.

Ben Dunnell

Scaffolding surrounds Victor K2 XL231 at Elvington during late May as its repaint proceeds. YAM



The vast fuselage of *Philippine Mars* at the Pima Air and Space Museum on 17 May, following its nocturnal arrival to avoid regular traffic. PASM

MARS MAKES IT TO PIMA MUSEUM

Martin JRM-1 Mars BuNo 76820/ C-FLYK *Philippine Mars* arrived at the Pima Air and Space Museum during the early hours of Saturday 17 May at the end of a 150-mile, week-long road trip from Lake Pleasant, 43 miles north of Phoenix. On 23 May the centre wing box was reattached by Southwest Industrial Rigging, contractors for the epic journey. The former fire-bombing leviathan had made its final ever landing on Lake Pleasant on 10 February after flying more than 1,500 miles from Vancouver Island, Canada. *Philippine Mars* was donated to the Pima museum in April 2024 by Coulson Aviation, which had operated C-FLYK and its sister-ship *Hawaii Mars* — now on show at the British Columbia Air Museum in Sidney — from Sproat Lake, near Port Alberni. *Philippine Mars* flew its last ops in 2007.

WALTER EICHHORN 1936-2025

Well-known German warbird pilot Walter Eichhorn died on 25 May, at the age of 88. Having learned to fly privately in Canada, where he owned a Fairchild Cornell and a Harvard, he returned home in 1966 to join Lufthansa, enjoying a 30-year career with the carrier. But in parallel he was among the pioneers of formation sport parachuting in West Germany, and in the late 1970s he acquired another Harvard, D-FHGK, which he owned until 2020.

That aeroplane was Walter's route into warbirds. He piloted a newly restored Hispano Buchón, D-FEHD, for Hans Dittes, and took part with it in the filming of *Piece of Cake* and *Memphis Belle*. It led to what was then Messerschmitt-Bölkow-Blohm asking him in 1993 to display its Bf 109 G-6, D-FMBB. Walter performed in it, and the other 109s operated by the company in its various iterations up to EADS, for 16 years. With his son Toni he flew countless demonstrations in a Harvard duo and further combinations, latterly with two Extra EA330s. Walter carried on displaying until 2019, and was still flying privately after that.

Aeroplane sends its condolences to this very characterful, entertaining aviator's family and friends. ***Ben Dunnell***

DR ANDREAS ZEITLER

HERITAGE FLIGHT
Walter Eichhorn
EADS

DESMOND PENROSE 1930-2025

Test and display pilot Desmond Penrose has died aged 95. A full appreciation appears on pages 80-87.

NEWS IN BRIEF

CENTENARIAN WAAF AMONG ARBORETUM VETERANS

102-year-old former WAAF Mary Marsden travelled from her home in Sheffield to join dozens of other World War Two veterans at the VE-Day commemorative service at the National Memorial Arboretum near Lichfield, Staffordshire on 8 May. Betty was a cook at RAF Finningley, and remembers serving bacon and eggs to the returning No 106 Squadron Handley Page Hampden crews. She said, "My husband served in the RAF as a chief technician and we spent many happy years together in married quarters."

TIGER AND HARVARD FOR WIGRAM

The Air Force Museum of New Zealand at Wigram, Christchurch has acquired two significant former Royal New Zealand Air Force Historic Flight aircraft following their retirement from flying at Ohakea. North American Harvard NZ1015 is the longest-serving specimen of its type, having been in RNZAF ownership since September 1942, its flying career spanning 76 years, and Morris Motors, Cowley-built de Havilland Tiger Moth NZ662 was shipped to New Zealand in July 1940, being finally sold onto the civil market in January 1946.

FIRST PRODUCTION 'JAG' FOR FLIXTON

SEPECAT Jaguar GR1B XX108, which has spent the past 19 years suspended from the ceiling in Duxford's AirSpace hangar, will soon move to the Norfolk and Suffolk Aviation Museum at Flixton, with Sea Harrier FA2 ZA175 going in the opposite direction. XX108 was originally built as the first production Jaguar GR1, making its maiden flight on 12 October 1972.

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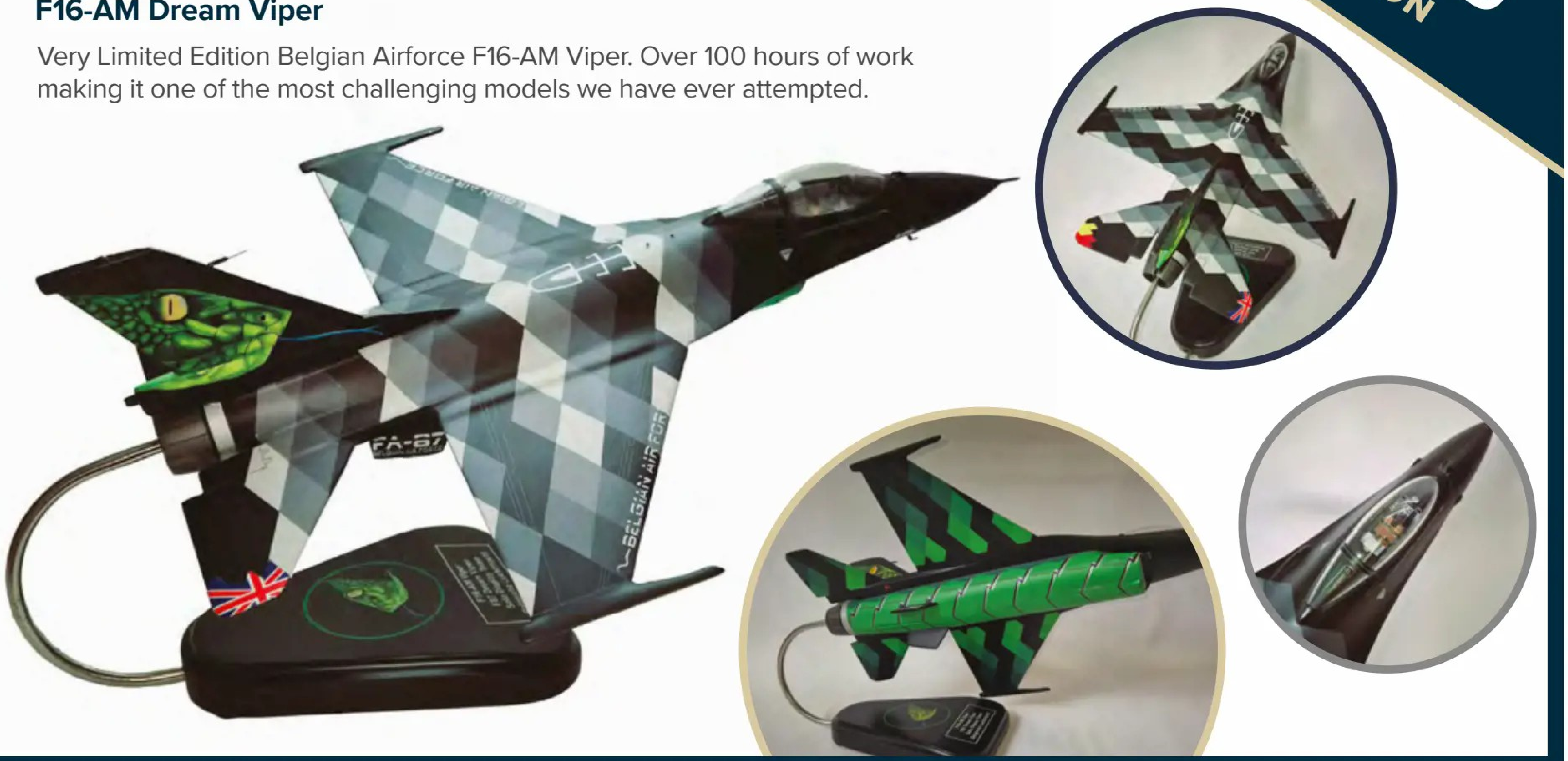

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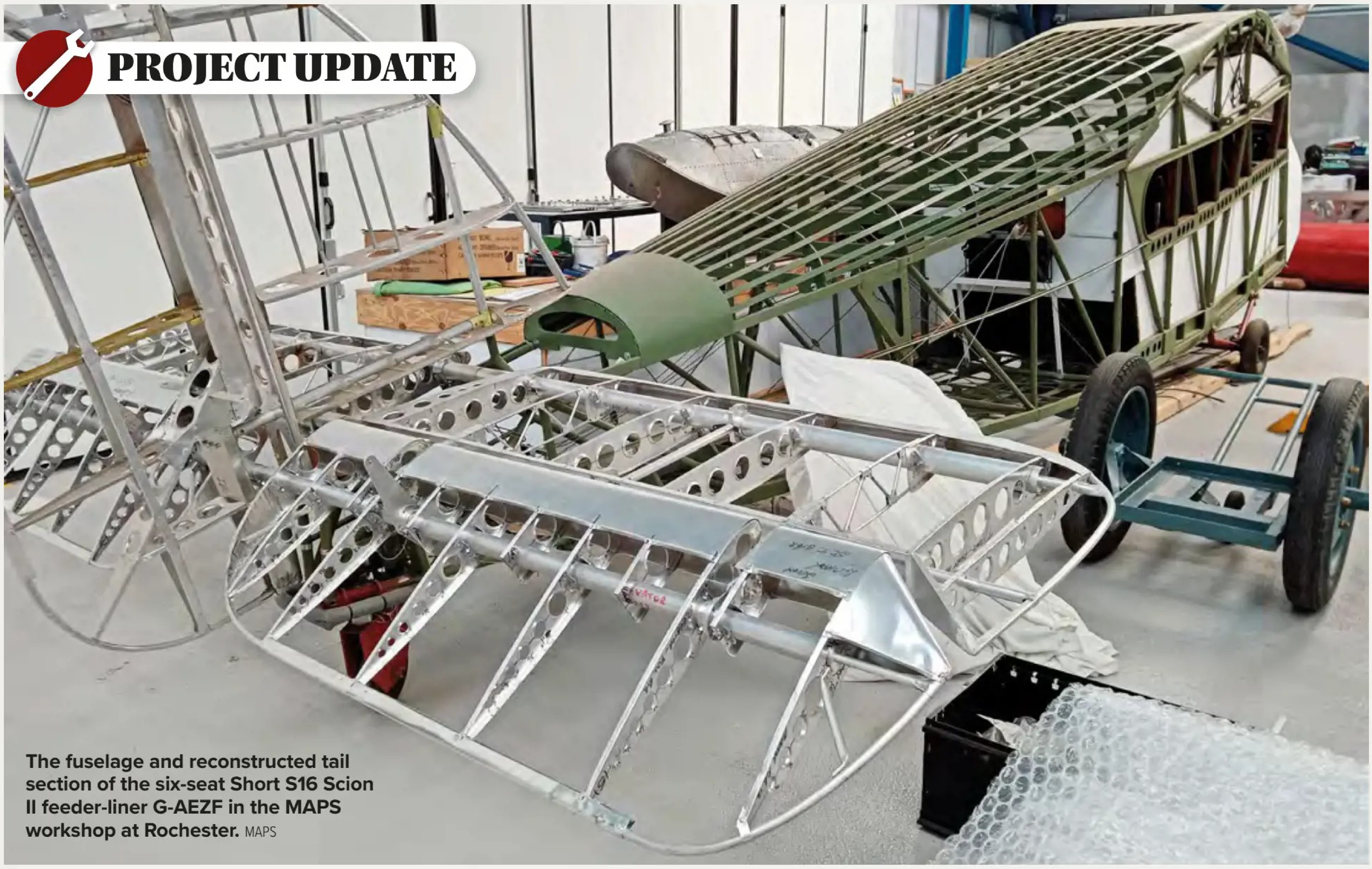


The fuselage and reconstructed tail section of the six-seat Short S16 Scion II feeder-liner G-AEZF in the MAPS workshop at Rochester. MAPS

Rochester's ecclesiastical Scion

Twelve years after arriving in a state of dereliction at the Rochester Airport workshops of the Medway Aircraft Preservation Society, the fuselage of Short S16 Scion II floatplane G-AEZF will go on display in Rochester Cathedral during August, a short distance along the River Medway from the old Short Brothers factory on Rochester's Esplanade.

Restoration by MAPS volunteers has been made possible due to a £40,000 charitable grant from the Rochester Bridge Trust, whose director of charitable projects Nicola Parks says, "It gives us great pleasure to be able to display this piece of local aviation history in a stunning venue that's easily accessed by the whole community.

"Alongside the floatplane there will be a range of educational activities to ensure there is something to appeal to all ages. This event will be completely free of charge during the day, with the air of celebrating aviation history while also inspiring the next generation of engineers."

Built in 1937, by the time it arrived at the MAPS workshop the machine was in a sorry state, with a badly corroded port wing, just the inboard section of the starboard wing, no tailplane, and a cockpit stripped of instruments. Project leader Robin Heaps who, when the Scion arrived, had recently retired from a senior position at the BAE Systems factory on the Rochester Airport site says, "No-one else seemed to want to take the project on, and I must admit, when I first saw the state of the airframe I wondered what I had let myself in for. But I also think it is important that at least one example of every type of aircraft produced by British aviation companies should be on display somewhere in the country. For Rochester and the Medway towns it was obvious that Short Brothers used to be a major employer for the area, but, more importantly, that there should be a suitable memorial for the great aviation company they were."

A team of six volunteers has worked an average of 10 hours per week on the project over the past decade. Heaps continues, "After so many years of work on this complex project we are all looking forward to seeing the Scion on display in Rochester Cathedral. We are grateful to Rochester Bridge Trust for its generous grant and for making it as easy as possible for residents to experience this important part of Medway's heritage."

Rochester Bridge Trust was founded way back in 1399 and is the only surviving independent bridge trust that serves its original purpose. It owns and maintains the road and service bridges over the Medway at Rochester and has contributed to the cost of many other Medway crossings over the centuries. It also makes charitable grants and supports charitable and educational projects in Kent. The trust is particularly committed to supporting engineering and agricultural education.

Scion G-AEZF made its first flight on 22 September 1937 with legendary Shorts test pilot Capt George Lankester Parker at the controls. After being moved from the waterfront site to Rochester Airport, it was damaged during an air raid during September 1940, and following repairs and conversion to landplane configuration went to No 24 Elementary Flying School at Barton-in-the-Clay, Bedfordshire during 1941, and later to Sealand.

With the end of hostilities it went back to its manufacturer at Rochester and subsequently flew with several companies, making its final flight from Elstree during the early 1960s. The Scion spent some time stored at the Historic Aircraft Museum at Southend, before being moved to Redhill aerodrome, Surrey, where it was threatened with scrapping until being saved by MAPS.

RAF MUSEUM HITS DOUBLE JACKPOT

On 8 May — the 80th anniversary of VE-Day — the National Lottery Heritage Fund announced the award of a £9.3-million grant for the Inspiring Everyone: RAF Museum Midlands Development Programme, which will result in a transformation of the RAF Museum Midlands at Cosford. The following week, a new partnership and major investment from BAE Systems was also confirmed at the museum's spring reception.

BAE Systems' contribution will be directed towards the redevelopment of the 1930s Hangar 1, which will house a new exhibition and learning centre alongside visitor facilities. Among the exhibits will be an ex-Red Arrows Hawk T1 and a full-scale model of the future Tempest combat air system. Alongside this, other features of the programme include a purpose-built Collections Hub, enabling the museum's stored collection to be brought on site and opened to the public for the first time, and a new 'public realm' providing spaces for outdoor learning, activities and picnicking. Work on the hangar and the wider transformation programme will begin later this year, with completion expected by summer 2027.

Meanwhile, several important Cosford museum exhibits remain up for disposal, including Vickers Varsity T1 WL679 and Fieseler Fi 156 Storch Werknummer 475081. And, as we reported last month, English Electric Canberra B2 WH725 — the only unmodified B2 on display in the UK — has been reclaimed by the RAF Museum, following five decades on display at IWM Duxford.

Both of the RAFM sites already have Canberras on display. With the museum's store at Stafford soon to be closed and the storage blister hangars on the far side of the airfield at Cosford also due to be emptied, their long-term inhabitants, including Lockheed Ventura II AJ469 and Vickers Valetta C2 VX573, are also being offered for disposal. Some aircraft will be temporarily stored in the Michael Beetham Conservation Centre.

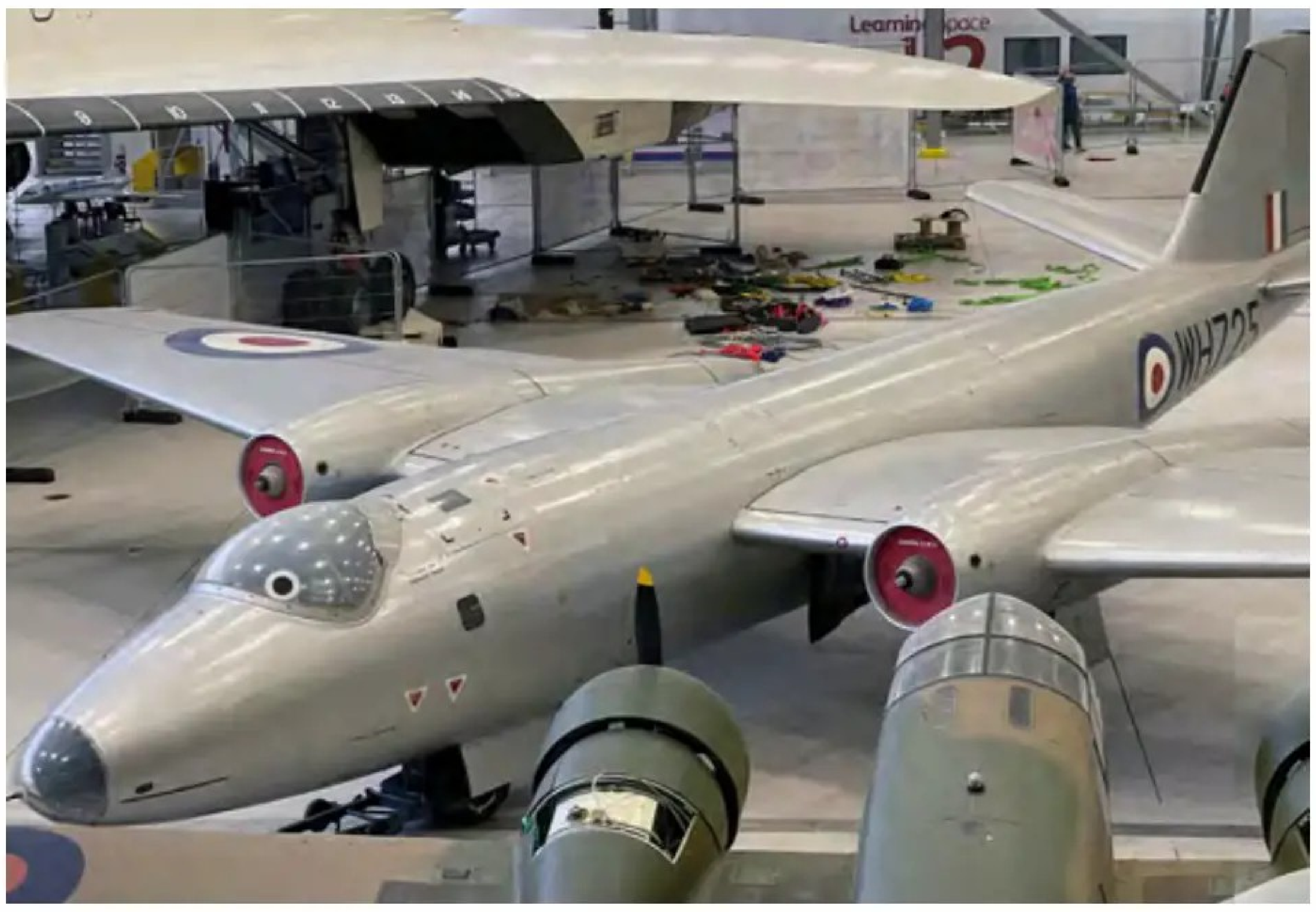
Aeroplane contacted the RAFM on what the future holds for WH725, which elicited the following official statement on 14 May: "We extend our deepest thanks to our colleagues at the Imperial War Museum for their stewardship of the English Electric Canberra. The Canberra holds a distinguished place in Royal Air Force history. During its loan to the IWM the Canberra has helped share the story of the RAF, British aviation and the Cold War. Its display has been a successful collaboration between our national institutions and allowed us to preserve and celebrate our shared aviation heritage.

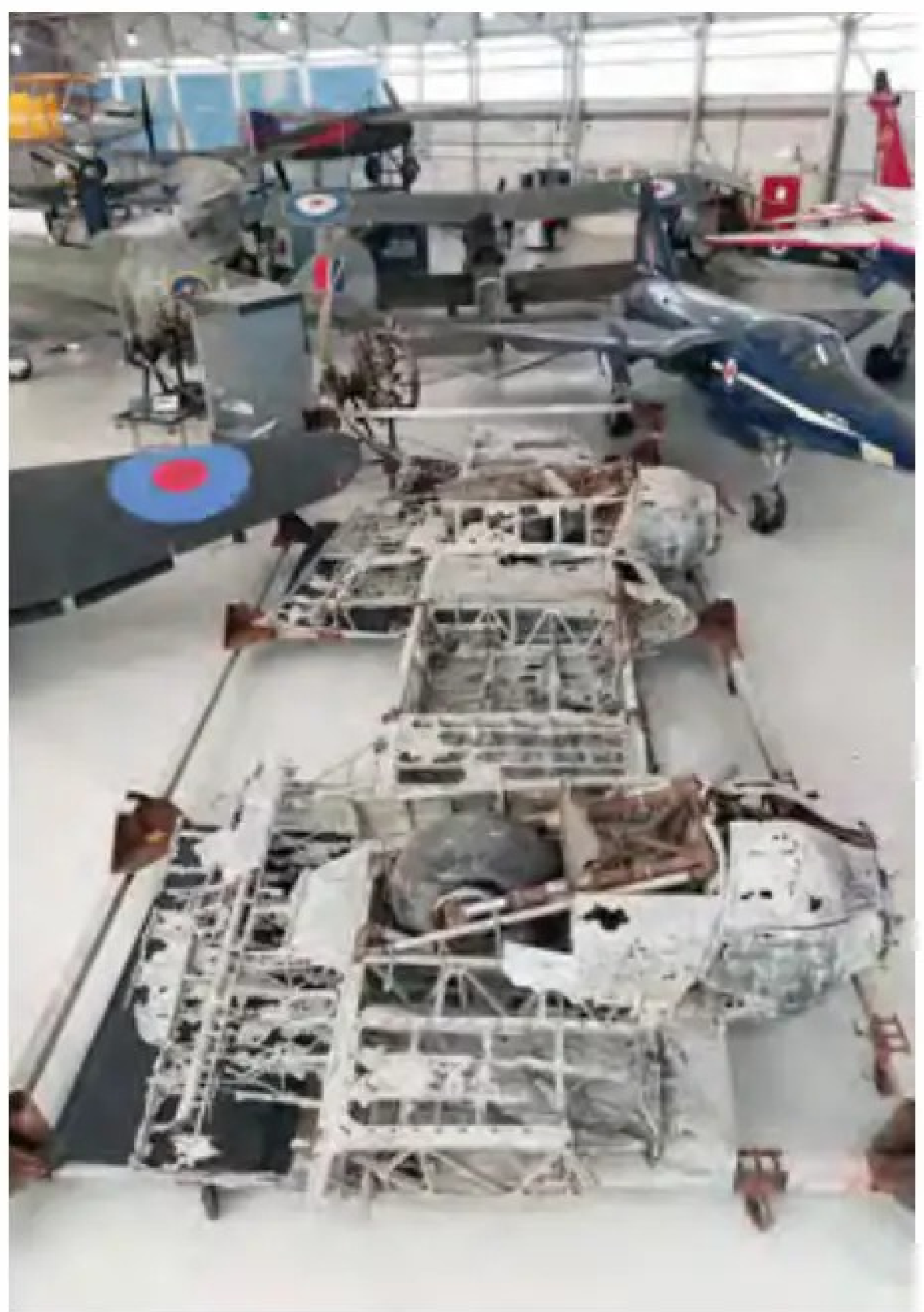
"The aircraft is now being prepared for return to the RAF Museum this autumn. The RAF Museum currently displays an English Electric Canberra PR3, WE139 at our London site and a PR9, XH171 at our Midlands site and we are actively assessing the most impactful future for the returning airframe — whether through storage, display, or strategic loan. We remain committed to honouring this historic aircraft and ensuring its legacy continues to inspire future generations."

Meanwhile, in mid-May the wing section of Dornier Do 17 Z code 5K+AR, which force-landed after an engagement with a Boulton Paul Defiant on 26 August 1940 and was recovered from the Goodwin Sands during June 2013, went on display at Cosford — appropriately, adjacent to Defiant I N1671.

WELCOME
COLLECTIONS HUB

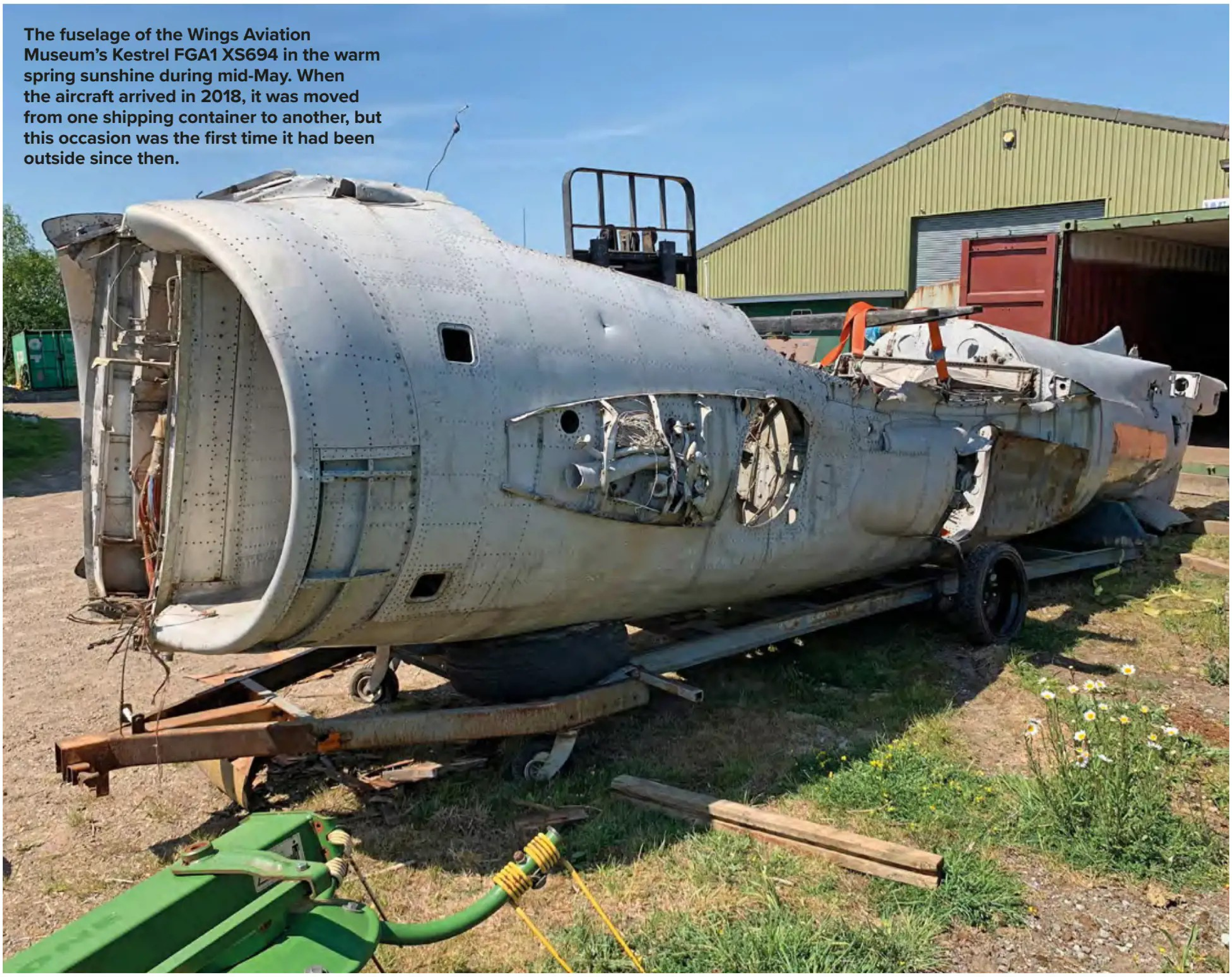
A computer-generated impression of the interior of the RAF Museum Midlands Collections Hub, which will permit public access to much of the museum's stored collection for the first time. RAFM





ABOVE: At Duxford on 20 May shortly after being lowered from the ceiling of the AirSpace hangar, Canberra B2 WH725 has been reclaimed by the RAF Museum and will be leaving the Cambridgeshire airfield during the autumn, its future beyond that as yet being unconfirmed. TONY HARMSWORTH

ABOVE RIGHT: The wing of Dornier Do 17 Z 5K+AR on 21 May, soon after going on display at the RAF Museum Midlands. The engines and propellers are at middle left. RAFM

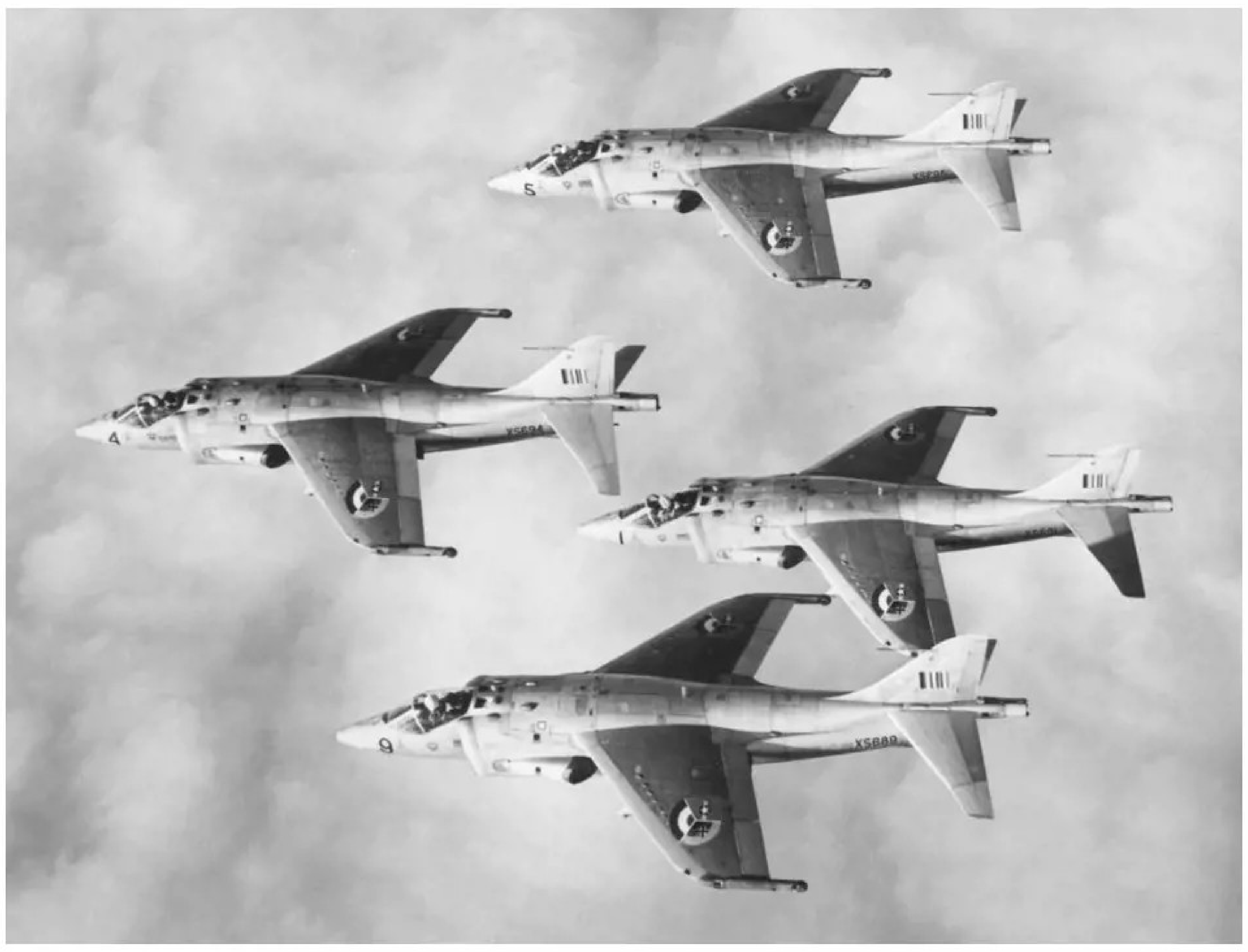


The fuselage of the Wings Aviation Museum's Kestrel FGA1 XS694 in the warm spring sunshine during mid-May. When the aircraft arrived in 2018, it was moved from one shipping container to another, but this occasion was the first time it had been outside since then.

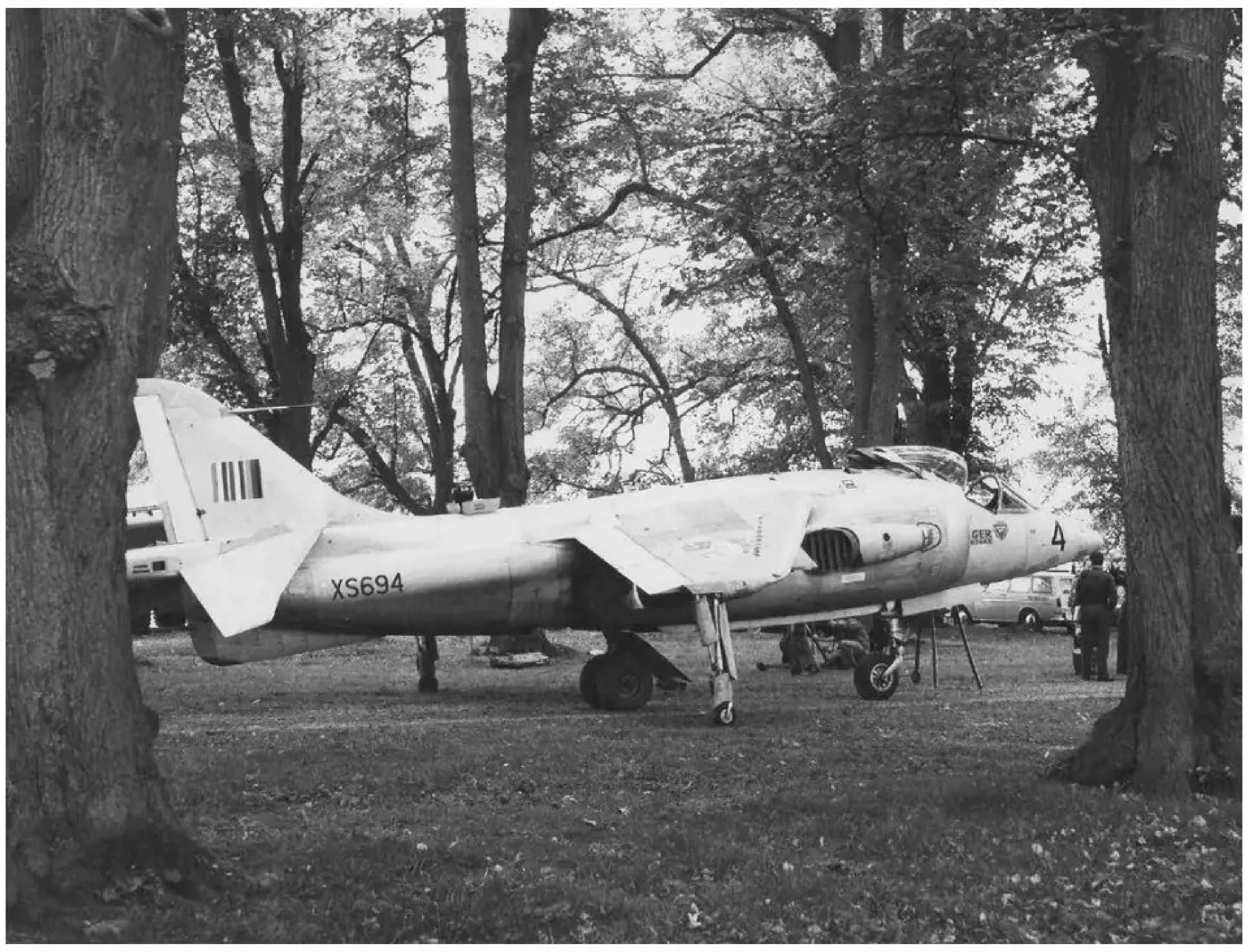
BIG WINGS

The sheer amount there is to see at the Wings Aviation Museum cannot fail to impress. With the restoration of a Hawker Siddeley Kestrel, it's taken on another ambitious project — one with a view to an expanded future at a new and very historic location

WORDS AND PHOTOGRAPHY: BEN DUNNELL



XS694 is the lead aircraft in this four-ship of Tripartite Evaluation Squadron Kestrels, flying from West Raynham, Norfolk during 1965. BAE SYSTEMS



The Kestrel evaluation unit was based at West Raynham, but deployed regularly into the field to test the aircraft's capabilities, as '694 demonstrates. KEY COLLECTION

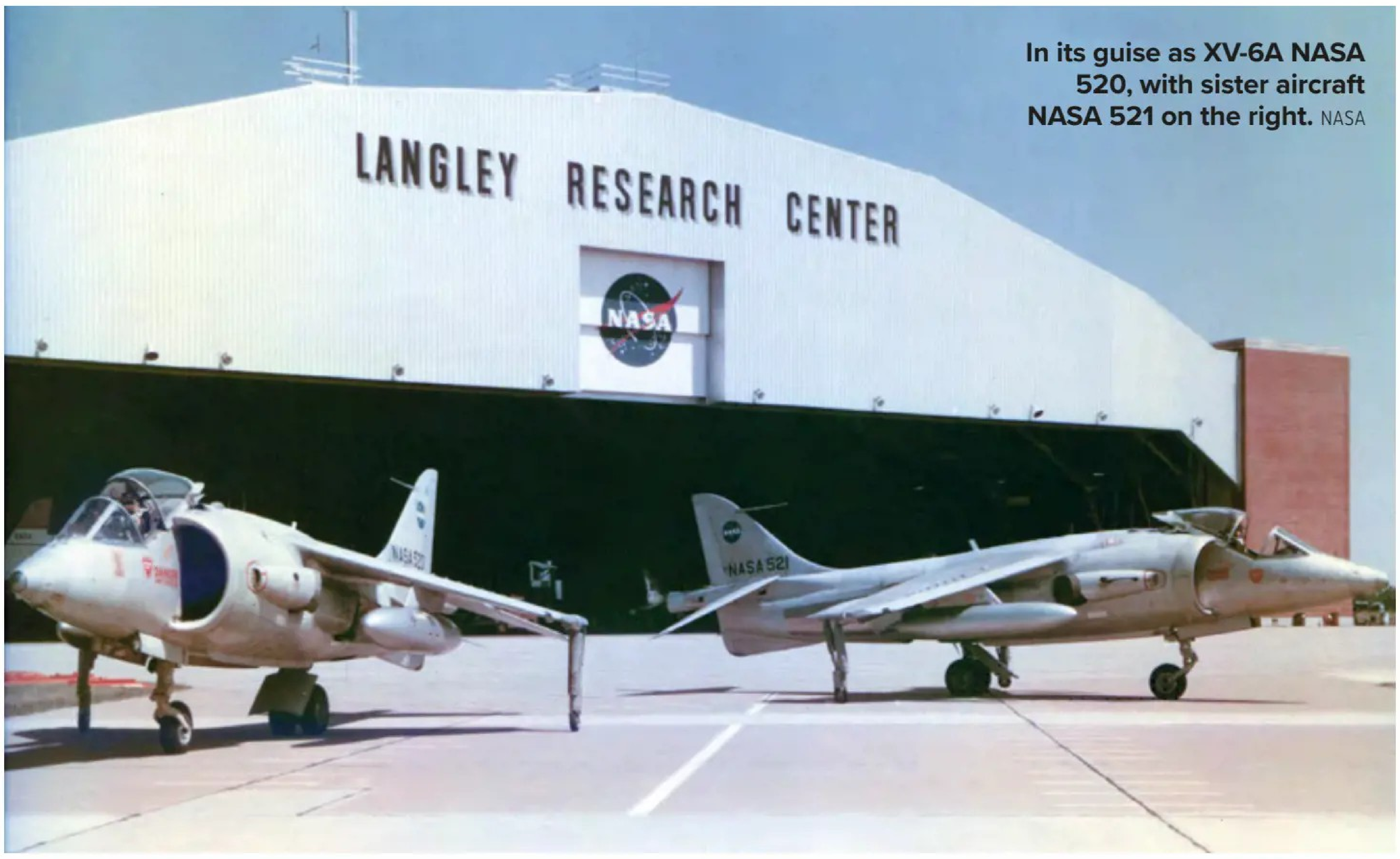
It's not something you expect to see down a West Sussex country lane. The farm buildings aren't out of place, but the fuselage outside them is. No ordinary fuselage, either: a very rare Hawker Siddeley Kestrel, forerunner to the Harrier, which has just emerged into the daylight for the first time since arriving back in Britain seven years ago. And if that in itself represents a homecoming, better is to follow.

The location is just north-west of the village of Balcombe, and this is the home of the delightful Wings Aviation Museum. Its packed displays detail the World War Two campaigns in many theatres, melding such potent exhibits as A-20C and A-20G Havoc/Boston recoveries from Russia into the fullest representation of the type in Britain, or a P-63C Kingcobra and Nakajima B5N2 'Kate' shown as found in the Kuril Islands, with a host of smaller, personal items reflecting individual lives and stories. Yet the Kestrel absolutely fits into the museum's plans, centred not around this rural setting but Dunsfold Park, about 25 miles further north-west in Surrey.

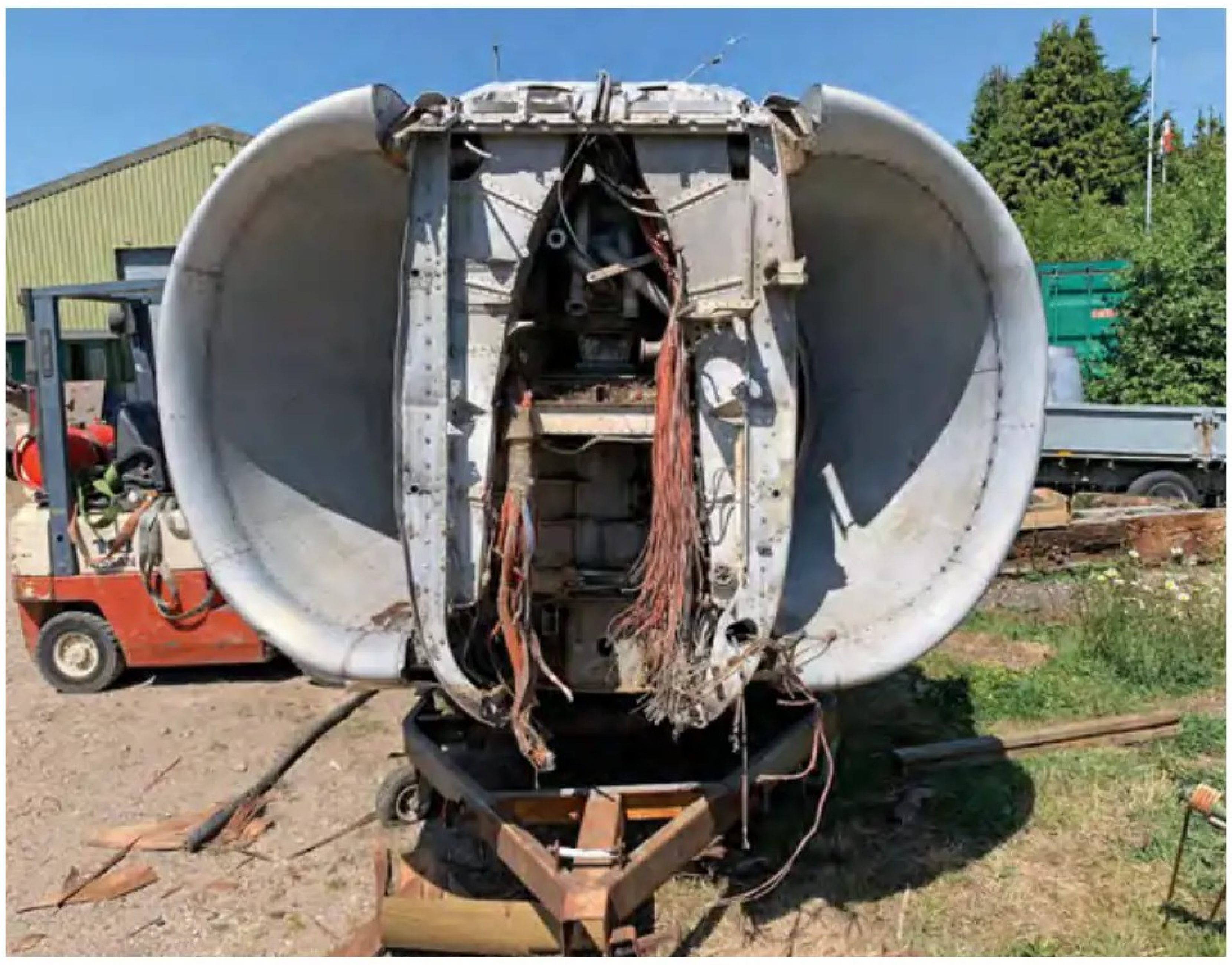
It was with those developments in mind that, seven years ago, curators Daniel and Kevin Hunt made the acquisition. Aaron Simmons, an engineer for a major airline who volunteers as one of the joint Kestrel project leads and is a museum trustee, takes up the story. "They were in Belgium for a memorial unveiling, and were in a bar one evening, having a few Duvels, when it popped up on Facebook Marketplace. Within an hour of it being for sale, they'd purchased it. The original advert said, 'Designed in America, built in America, should stay in America,' because it was ex-NASA, but obviously not. Built at Kingston, final assembly at Dunsfold, and first flew at Dunsfold."

Kestrel FGA1 XS694 was among the batch of nine such aircraft ordered as a bridge from the experimental Hawker P1127 to an operational V/STOL jet, which, of course, resulted in the Harrier. Accord in May 1962 between the British, American and West German governments led the following January to a formal agreement, and on 7 March 1964 to the type's maiden flight. XS694 was the seventh example, taken into the air by Duncan Simpson on 10 December 1964 and delivered in early February 1965. With pilots from the three participating countries, the Tripartite Evaluation Squadron at West Raynham started work on 1 May, amassing 1,367 Kestrel sorties over the next seven months. A major proportion of its activity until 30 November involved field operations,

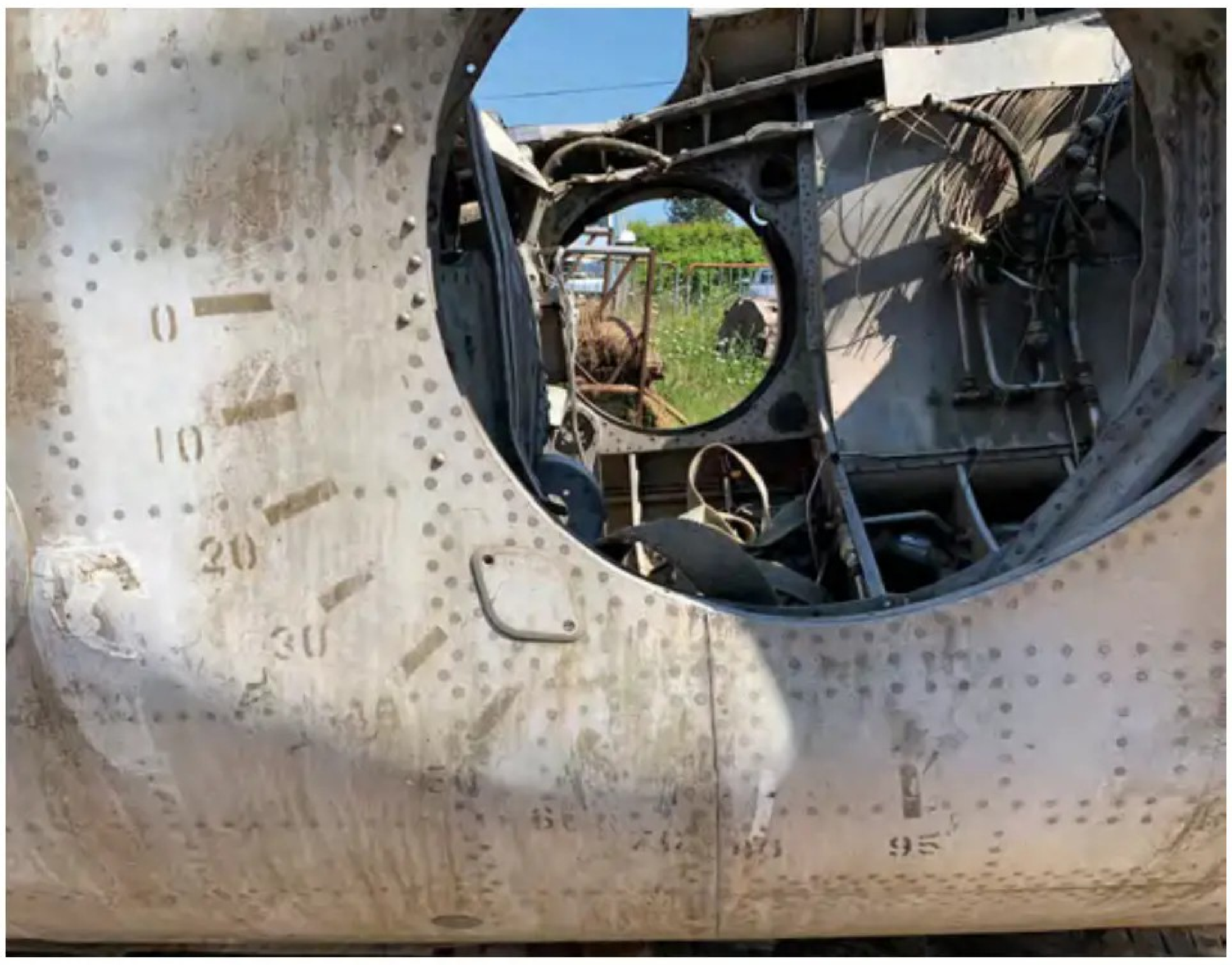
> ***"Within an hour of it being for sale, they'd purchased it"***



In its guise as XV-6A NASA 520, with sister aircraft NASA 521 on the right. NASA



The damaged nose was removed from the fuselage in order to go through restoration.



Vectored-thrust nozzle position markings are still visible on both sides of the fuselage.

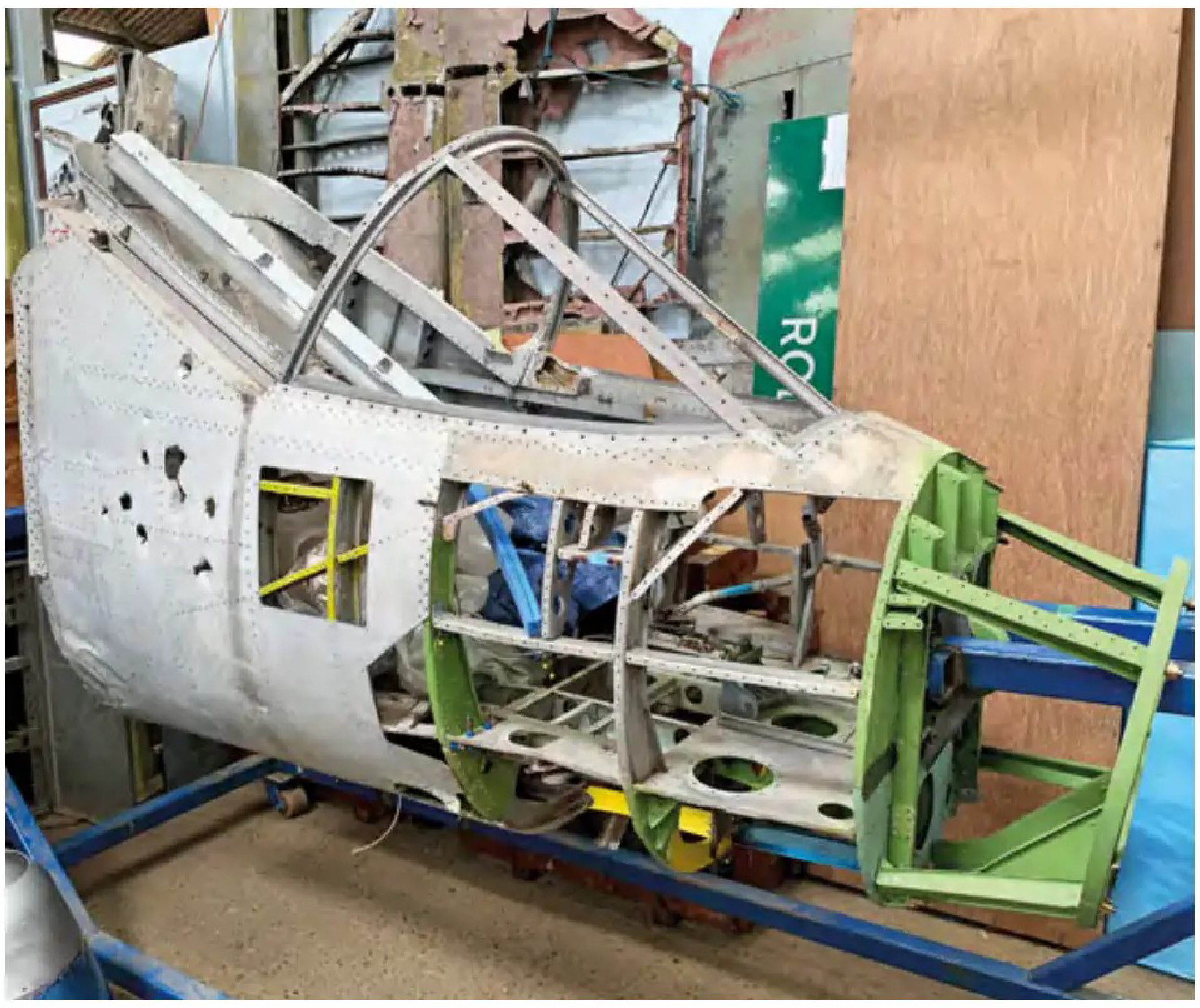
using seven dispersed locations to test the special capabilities of this new form of combat jet.

These successful trials and cancellation of the supersonic P1154 led an order to be placed for the P1127(RAF), as the Harrier was dubbed at this stage. West Germany decided to go its own way, so when the Kestrel effort ended and the eight surviving aircraft — one having been written off — went their separate ways, the US took three more of them. Six went Stateside, being given the designation XV-6A for tri-service evaluation at Eglin AFB, Florida, involving the army, navy and air force. Shipped across the Atlantic on 11 January 1966, XS694's new US Air Force serial was 64-18268.

◆

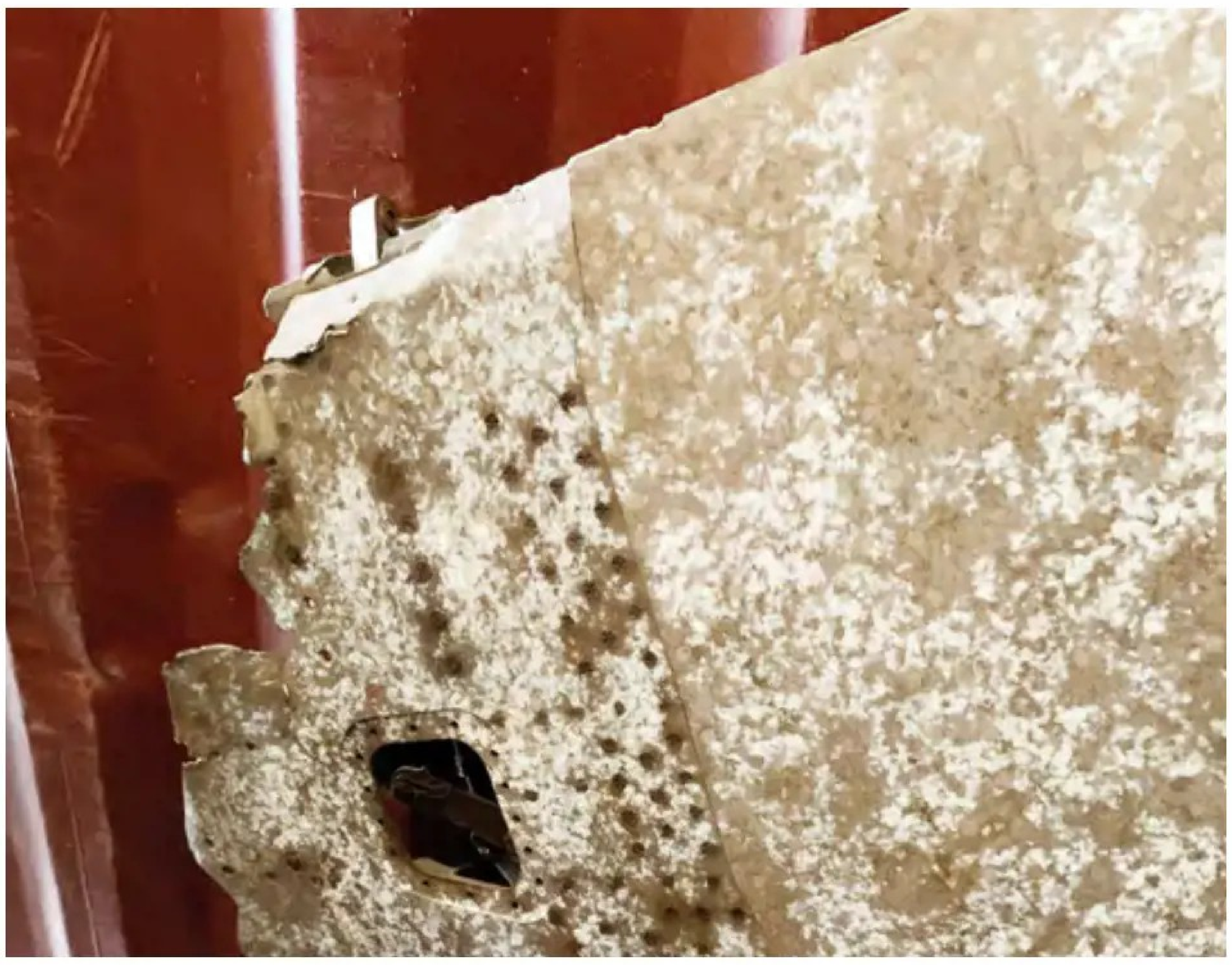
At this stage the American military felt it had no need for such a machine, despite notably productive shipboard work which was a portent of US Marine Corps employment to come. NASA, however, was a different matter. It requested two XV-6As for experimental purposes, XS694/64-18268 being delivered to the Langley Research Center in Virginia on 23 July 1966. There it took up the identity NASA 520 for use on various V/STOL-related test efforts, until 27 August 1967 brought a mishap that spelled an end to this aircraft's participation. In the hands of Lee H. Person, a landing at Wallops Island, Virginia, went wrong, NASA 520 entering a groundloop. Despite damage to the forward fuselage, Person got out unscathed, but the Kestrel would never fly again. Instead it was cannibalised as a spares source for sister-ship NASA 521, the former XS689/64-18263, while XS692/64-18266 confusingly became a second NASA 520.

The continued survival of XS694 came to hang by a thread. It was all very well being in the hands of Tom Reilly's Flying Tigers Museum at Kissimmee, Florida, its initial destination after being disposed of by NASA, but ending up in a Pennsylvania paintballing field was another matter, as the holes on the skin still testify. Another private owner acquired it from there, most likely with a view to cutting the airframe up — indeed, the wing was cut



The nose in the Balcombe workshop. The green components are those which have been fabricated from scratch with the aid of CAD.

By the time this is read, the newly made nosecone should have been anodised, thanks to an ex-Hawker man.



Wing damage as sustained in the aircraft's 1967 landing mishap at Wallops Field.

Kestrel project leaders Aaron Simmons (left) and Dave Cotton.
VIA WINGS MUSEUM

in half. Thankfully the Wings Museum's intervention in 2018 stopped all that.

That wing would appear to have been swapped with XS689's prior to the Wallops Field accident, though exactly when and why this occurred remains a mystery. It still shows damage from the ground-loop, about which Aaron Simmons says, "We plan to repair that. We've got a repair scheme for it; we'll pull it onto the original fuselage and jack the wings up until it joins. Then we'll make the plate that goes across the top and one across the bottom". The museum even has a back-up, in the form of a spare from P1127 XP984 at the Brooklands Museum. "It doesn't quite fit, but we may make it work. But it would be better to have its original wing, because, obviously, the 1127 wing has a straight leading edge and this has got a curve."

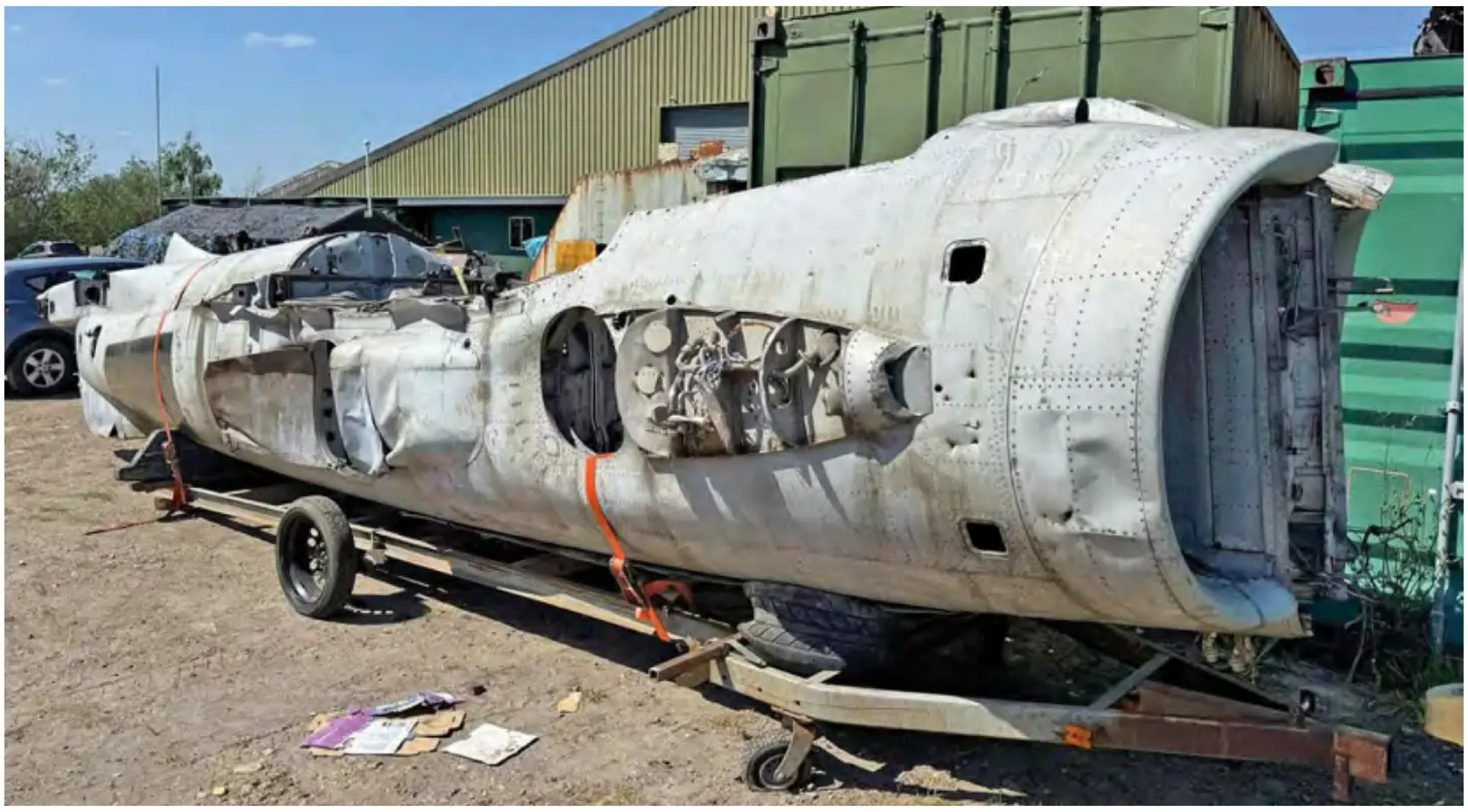
Missing from the Kestrel when it was purchased were the undercarriage, nosecone, tailplane and tail cone, horizontal stabiliser, and the combined airbrake and main undercarriage door, among other items. In setting about a full structural restoration, making XS694 cosmetically correct, attempts to source replacements got straight under way. Where this hasn't proved possible, good use is being made of the experience on tap.

The other joint project lead, Dave Cotton, worked on Harriers for about 28 years with British Aerospace and BAE Systems. Already he has set about fabricating some new items, such as the airbrake — one of which he also fashioned for the Brooklands P1127 — and the nosecone, despite a lack of drawings. He roughly knew most of the measurements, including the length from Kestrel XS695 at Cosford, so plans were drawn up by a volunteer and the metal spun by a friend of Dave's.

It was decided to begin with the cockpit, as it fits into the Balcombe workshop. The bulkhead frame was damaged, so drawings were produced using a computer-aided design program and a replacement laser-cut. New skins are having to be made for it owing to the poor state of the originals, being rolled in the traditional way using an English wheel. The front skins are being tackled first, as they're more difficult, followed by the rear. "Once that's done", says Simmons, "we'll start on the main fuselage, probably on the main structural pieces that need doing". Cotton adds, "We'll have to have a stand made for that, to support it so we can get access all round it — pretty much how the build jigs were."

Most of the cockpit panels are in the museum's possession, and those items which aren't are gradually being sought. The canopy transparencies and

> “We've got a repair scheme for the damaged wing”



A former boat trailer now supports the fuselage, as the wooden frame it was on before had deteriorated.
VIA WINGS MUSEUM

framework on a Harrier GR3 are the same as a Kestrel's, but the windscreens are different, so they will most probably have to be made afresh. A Martin-Baker Mk6HA ejection seat is also required.

A very fortunate find was a suitable engine. The Kestrel is supposed to have a Bristol Pegasus 5, but a Pegasus 3 version as used in the P1127 was located very nearby — at the Gatwick Aviation Museum, which is only 10 miles north of Balcombe. "They needed a Pegasus 103 for their Harrier GR3", says Simmons, "so we went and purchased a 103 and did a trade. It's got a few bits missing — the fuel control unit's missing — but it will still go into this airframe."

> ***"Everyone loves our museum because it's so different"***

The undercarriage has involved a more protracted saga. In February 2019 the Kestrel team contacted the RAF Museum, knowing it had some spares in storage. This set in train a long process, through the course of numerous RAFM reviews, but recently a collections manager made contact and got the ball rolling again. Simmons recalls, "It went to committee review that week and they said yes, not only to one set but to all of them. Within a month we had them. We've got three nose gears, two main gears, one outrigger and two mainwheels. One of the main gears has got brake units on, which is absolutely fantastic. It's really going to push this project along."

"We've discovered", says Cotton, "that the used nose gear and the used main gear with the brakes on are from XP980, which is the P1127 at Yeovilton [in the Fleet Air Arm Museum]. As it's sitting in the hangar there it's got GR1 legs". Ironically, he adds, "The beauty of this aircraft is that a lot of the parts are similar to a [Harrier] GR1. They copied the drawings and gave them new part numbers... We can get a part that may not necessarily have the right holes in it, but the shape and everything is the same."

As so often, delight is to be found in the details uncovered during restoration. The very substantial valves for the wingtip control nozzles, for example, are works of engineering art, fashioned from flat pieces of sheet metal. Also, the wooden delivery crate in which the 'new old stock' undercarriages came from the RAF Museum still has on it the original paper delivery label, dating from when Dowty-Rotol in Gloucester sent it to Hawker Siddeley at Richmond Road, Kingston upon Thames. Wonderful.

The current thinking, when the Kestrel reaches completion, is to have one side finished in Tripartite Evaluation Squadron colours and the other as NASA 520. Its skin is being anodised, which is correct, rather than painted, so it will be possible to apply decals. Some new top skins are among the items which have been donated by the No IV(AC) Squadron collection. In quite a lot of places, though, it will be possible to perform localised patch repairs to damage, such as that caused at the paintballing attraction.

So it is that a long-neglected aeroplane, which might have been lost altogether, is receiving a new lease of life. The Wings Museum, too, is heading towards a fresh future. Established in 2003, it was located at Redhill, but once its building was refurbished the

Restoration work on B-25J Mitchell 44-30861, with the nose and wings progressing. The rest of the fuselage is displayed outside, awaiting its turn.

WINGS
MUSEUM
DUNSFOLD

An architect's impression of part of the new Wings Museum interior as planned for Dunsfold. VIA WINGS MUSEUM

rent was put up, so it had to find a new location. It's been at Balcombe for 15 years, but the Dunsfold Park plans are now on the near horizon. The new museum site is on the southern side of the old Dunsfold aerodrome, in an area that's no longer part of the airfield, but where the remnants of former taxiways and hardstandings are still visible.

Aaron Simmons relates the tale. "We have been granted full planning permission, after a long time. The land was purchased for us by an anonymous donor — it's ex-No 98 Squadron land, so our B-25 will go into No 98 Squadron colours. We went for outline planning, which the council was all for. We wanted a certain size of building, and they said that if we went for more than we wanted it would go through. It didn't. It got rejected [in December 2018]. All the councillors said no except one, the only one on our side that day. Then it went to the Secretary of State [for Housing, Communities and Local Government], which took a few years… It was approved, so we've got full planning. We've implemented the planning by putting an entrance in, and now we're going for funding for the building."

❖

It's been decided to go for function over form in the design, or, as Simmons puts it, "We need a bog-standard hangar that we can kit out and it'll be a fantastic museum. Everyone loves our museum because it's so different. You can touch things, everything's got its own little bit of history". While the entire collection will move there, the extra space will, of course, bring new opportunities. One half will contain the museum much as it is now, while the other will focus specifically on Dunsfold's heritage. And the facility will have nice surroundings, too, as the rest of this piece of land will become a nature reserve.

Being in Surrey provides a good catchment area anyway, and even more so if housing is built on the adjacent airfield site. Despite planning permission being granted in 2018, still nothing of the long-intended 2,600-home garden village has come to fruition. The regional press has reported that Dunsfold Park is now off the local council's list of developments which will contribute towards its housing targets, owing to the lack of certainty over timescales. Setting up the museum will provide a boost to the area, and a focal point for its aeronautical history.

Whatever happens in that respect, a lot more ex-BAe people still living in the vicinity will join the volunteer team once the Wings Museum is established at Dunsfold. The hope is to get it done in two years, but it may take longer because it's likely an application will be made for National Lottery Heritage Fund money.

Already one airframe is there: ex-Royal Danish Air Force Hunter F51 E-430, a 1956 product of the Dunsfold factory, which was moved to the site earlier this year. Naturally, B-25J Mitchell 44-30861 — still universally known as *Bedsheet Bomber* after the name it had applied during the 1980s — will be a centrepiece, recalling the type's wartime operations from the RAF station. It's being vigorously worked on by the volunteers, and a deal has been done with a B-25 owner in the USA which will enable the aircraft's spar to be replaced, meaning the wings can go back on far more easily than would otherwise be the case.

It is difficult to think of three aircraft more appropriate to display at Dunsfold than these. Mitchell, Hunter and Kestrel back on their old turf — the prospect is splendid. So is the outlook for the Wings Aviation Museum, which deserves to be thought of as more than a hidden gem. The next stage in its development will help ensure exactly that.

For more information visit www.wingsmuseum.co.uk. If any readers have leads for missing Kestrel parts, especially a tailplane and fin, please contact the museum.

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STEVE SLATER

Hangar Talk

A vintage light aircraft aficionado's view on historic aviation

While much has been rightly made of the 80th anniversary of VE-Day, it remains to be seen whether VJ-Day on 15 August is celebrated in a similarly appropriate manner. One seriously hopes so, especially seeing as the role in the occupation of Japan by British and Commonwealth forces post-VJ-Day is far from well-known. Although America provided most of the troops, in particular the air contingent came from the RAF, Royal Australian Air Force and Royal New Zealand Air Force.

Japan was occupied and administered by the Allies from its surrender at the war's end until the Treaty of San Francisco took effect on 28 April 1952. However, unlike in Germany, the Allies never assumed direct control over Japan's civil administration. In the immediate aftermath of Japan's military surrender, the country's government continued to formally operate under the provisions of the Meiji Constitution.

One RAF officer who was part of that occupation was the late Jimmy James who passed away in his 100th year, two years ago. Initially an Air Training Corps cadet in his native Wales, he spent a significant time being instructed on Boeing Stearman Kaydets in the USA, before flying RAAF Curtiss Kittyhawks in Italy and being shot down while supporting Yugoslav patriots.

The late Jimmy James with a No 3 Squadron, RAAF Spitfire IX — and in the Shuttleworth Anson on a visit to Old Warden.

After a spell as a prisoner of war he rejoined No 3 Squadron, RAAF, on Spitfires in Japan as part of the occupying forces.

> *“The Spitfire's wing was an effective way of ‘showing the flag’”*

The Commonwealth presence in Japan was part of the British Commonwealth Occupation Force (BCOF) which, at its peak, committed about 40,000 personnel — about 25 per cent of the occupying troops. Stationed at Iwakuni near Hiroshima, the Mustangs of Nos 76, 77 and 82 Squadrons, RAAF formed the nucleus of Allied aerial activity there, although the air component of BCOF also included RAF and Royal Indian Air Force Spitfire squadrons, RAAF Dakota transports and Beaufighters used as light bombers.

The BCOF's primary task was to ensure Japan adhered to the terms of its surrender. Officially the Spitfire contingent was not a part of the BCOF — that was the Mustangs' role — but they carried out many duties on its behalf including flypasts over the centre of Tokyo, where the Supermarine fighter's distinctive elliptical wing proved an important way of ‘showing the flag.’

James was posted back to the RAF, where he stayed for the rest of his flying career. He ultimately made the Avro Anson's final operational flight as part of a formation of nine — just imagine the sound — Anson C19s of the Southern Communication Squadron at Bovingdon, Hertfordshire in 1968.

The deployment from Australia to Japan had created, at that time, the greatest mass flight in RAAF history. Seventy-eight Mustangs from No 81 Wing, accompanied by 43 other aircraft, took off from Labuan airstrip on the 2,500-mile journey to Iwakuni. Their departure left not a single Australian aircraft in Borneo. The Mustangs were escorted on their long journey by RAAF Catalinas, Mosquitos, Beaufighters and Dakotas, with special precautions taken to ensure radio communications were maintained throughout. A Beaufighter was used ahead of each flight of departing Mustangs to send back weather reports, while Dakotas carried maintenance personnel and spare parts. To guard against loss of aircraft in the sea, Mosquitos followed along to spot and report the position of any ditched aircraft to the Catalinas. Quite some undertaking!

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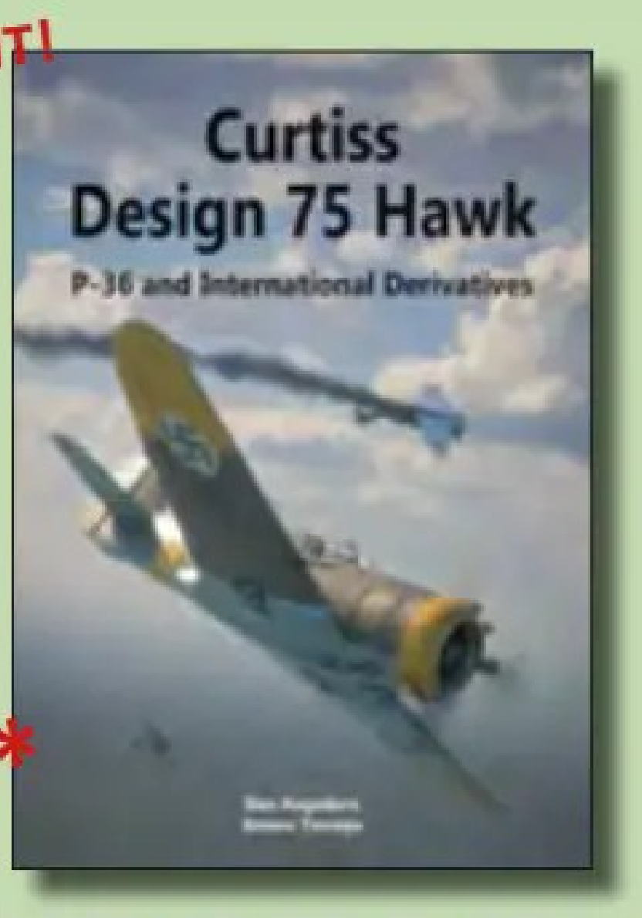
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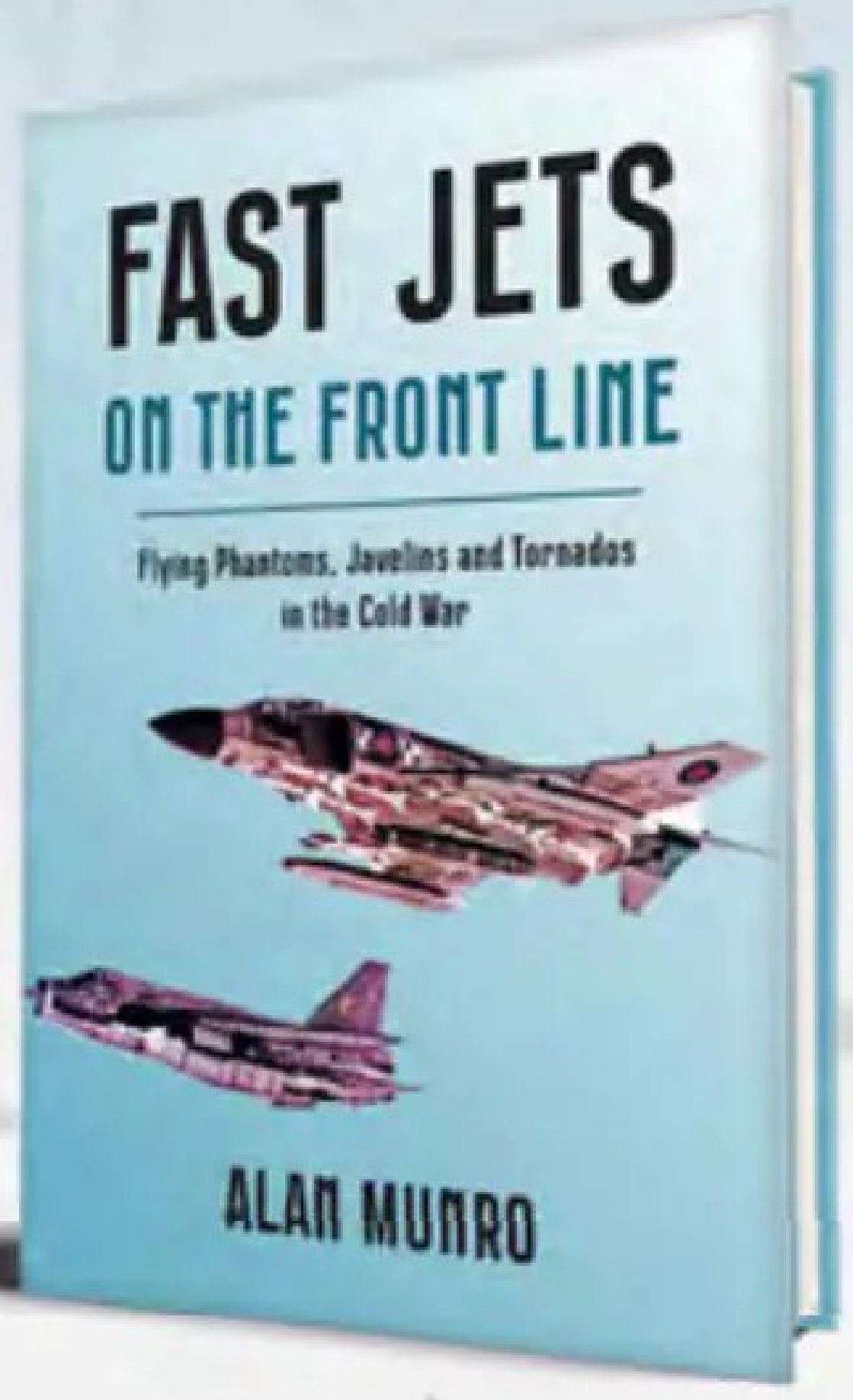
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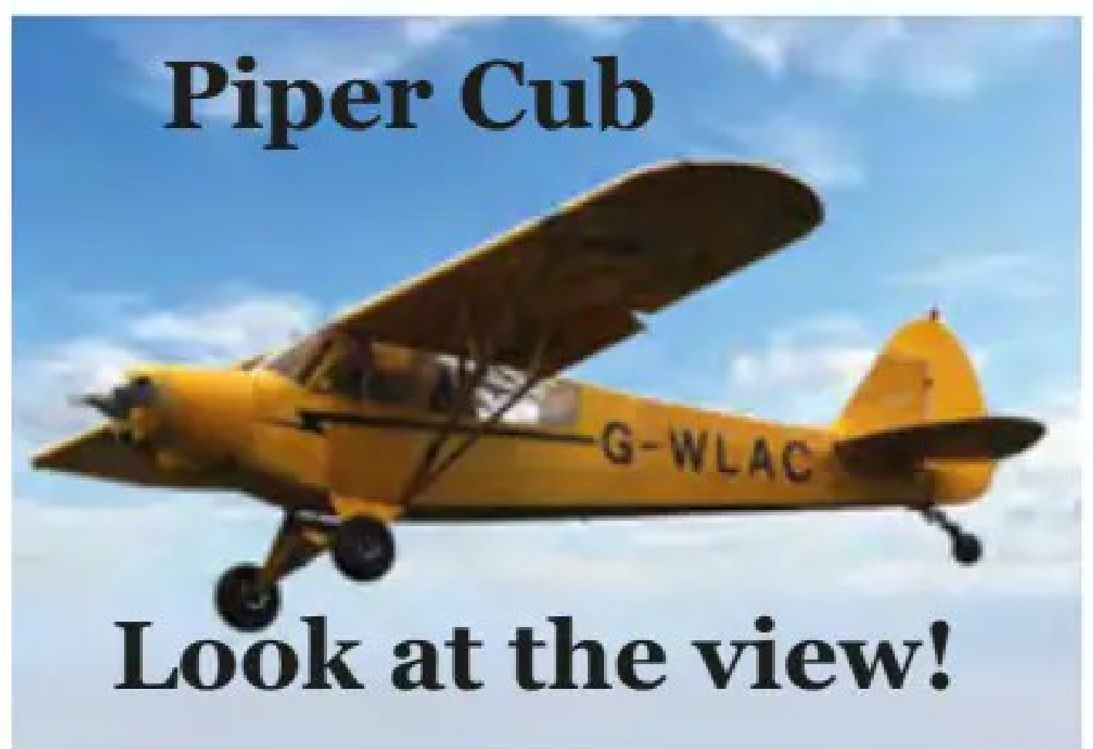
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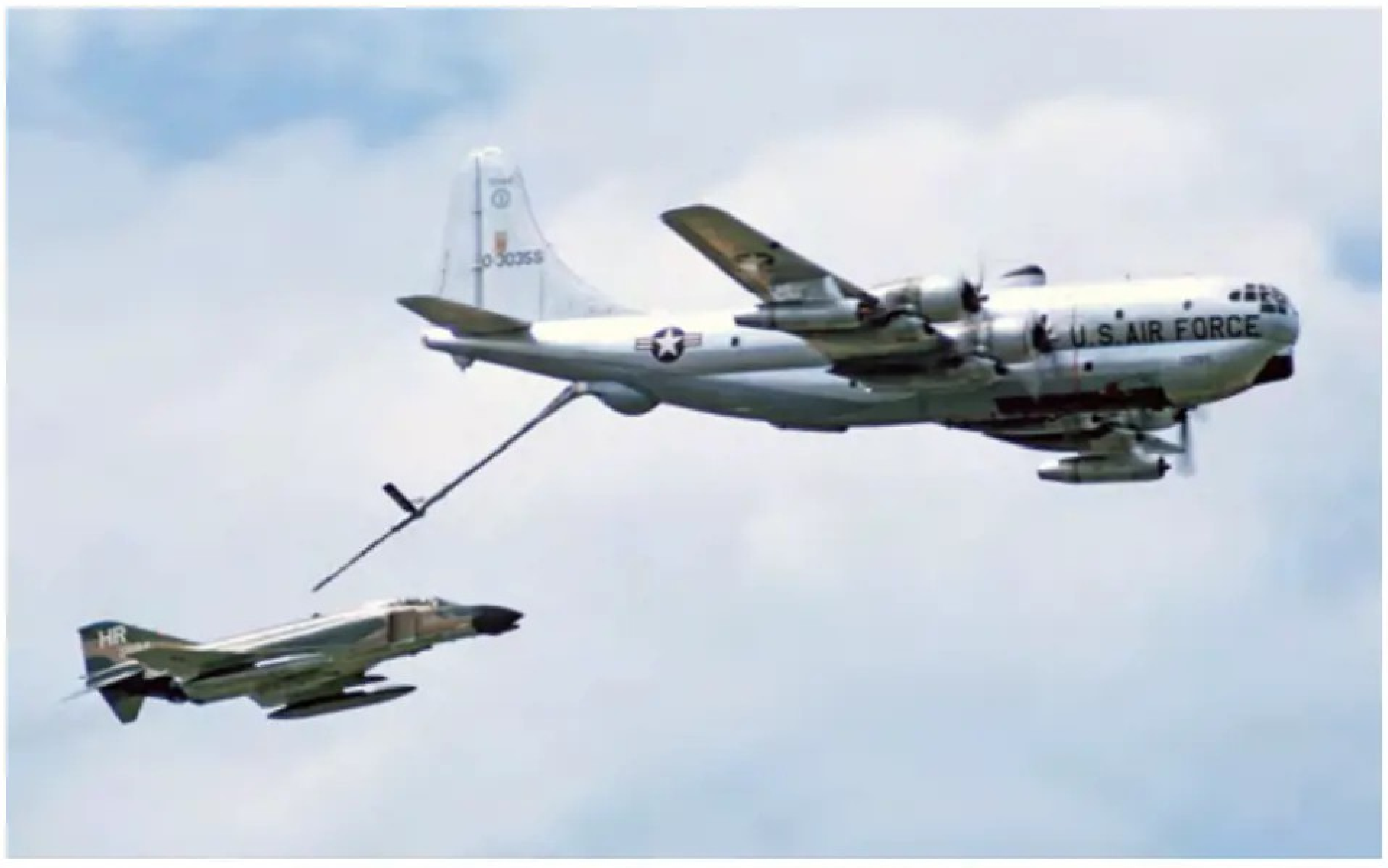
DENIS J. CALVERT

FlightLine

Recollections and reflections — a seasoned reporter's take on aviation history



Classics in close company, as KC-97L 53-0355 of the Texas ANG refuels a Hahn-based 50th TFW F-4E in June 1971. DENIS J. CALVERT

In the summer of 1961, the US Air National Guard received its first Boeing KC-97 tankers, with three squadrons re-equipping. The initial justification for this move was to provide an in-flight refuelling capability within the Air Guard and to facilitate the rapid deployment overseas of its fighter squadrons. When in August 1961 the Soviets and East Germans sealed off access routes to West Berlin, President Kennedy mobilised a number of ANG units, and a few weeks later more than 200 ANG aircraft — fighters and transports — deployed to Europe under Operation 'Stair Step' in a show of strength. While all crossed the Atlantic safely, the ANG had neither the equipment nor the training for in-flight refuelling. Thus, the fighters had to island-hop and take the 'long route' via Newfoundland, Greenland, Iceland and Scotland, or Newfoundland, the Azores and Spain, since the ANG KC-97 units were still working up on their new mounts. From then on, things improved steadily, and for Operation 'Ready Go' in August 1964, ANG KC-97s refuelled 19 F-100s and 12 RF-84s en route from their Stateside bases to West Germany in just nine hours.

A modification to fit two podded J47 jet engines from recently retired KB-50 tankers onto the four-piston-engined KC-97G was made and tested in 1964, giving rise to the KC-97L. This addition enhanced the aircraft's take-off performance, added 30kt to its (refuelling) speed and improved its altitude performance by close on 100 per cent. At a stroke, the KC-97 was given a new lease of life as a tanker and was henceforth able safely to refuel the USAF's newest fighters including the F-4.

With the Vietnam War in full swing and Strategic Air Command's bombers having first call on the KC-135 fleet, US Air Forces in Europe faced a critical shortage of tanker aircraft. The solution, initially promoted for just one year, was Operation 'Creek Party', under which ANG KC-97L units would deploy on a rotational basis to Rhein-Main, the type being well-suited to the smaller refuelling tracks over Europe. The first 'Creek Party' deployment started on 1 May 1967, and nine ANG groups maintained the commitment for exactly 10 years, ending on 30 April 1977.

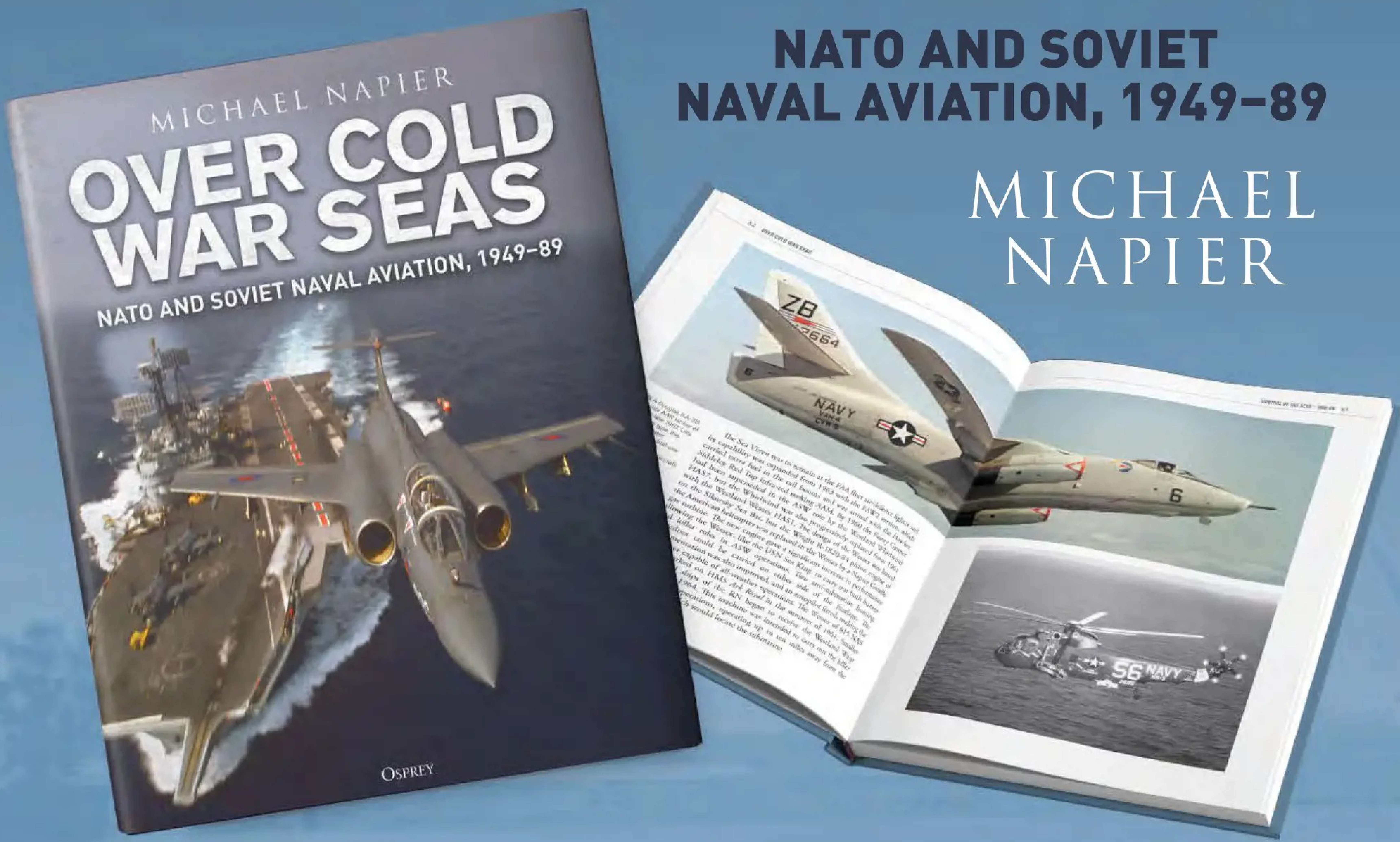
> **“This was my first experience of flying in a tanker aircraft”**

I had the good fortune to visit Rhein-Main in October 1975, to fly with the 126th Air Refueling Group, Illinois ANG, on a mission to refuel six F-4Es of the 32nd Tactical Fighter Squadron out of Soesterberg. This was my first experience of flying in a tanker aircraft; I was but a young lad back then. Once on Carol track, a figure-of-eight off the Dutch coast, and with the KC-97 wound up to its full six-engined operating speed, I made my way past the fuel tanks that occupied the port side of the upper deck — and filled the lower deck — to the rear fuselage, where the boom operator (or 'boomer') lay on his front on a couch, facing backwards at his station above a thick glass window. From here, he extended the rigid, telescopic flying boom and controlled it with the 'ruddervators', flying it into the slipway and nozzle connection point of the refuelling receptacle on the centre fuselage of the receiving Phantom. The KC-97's Boeing-designed flying boom had 20ft of extension and was capable of transferring 5,400lb per minute. Unlike with the RAF's probe-and-drogue system, the receiving aircraft has only to position his aircraft in an imaginary 'box' of airspace behind and below the tanker; the boom operator carries out the manoeuvring of the boom, to connect with the receiver. Seeing the operation close-up was a hugely impressive experience.

OVER COLD WAR SEAS

NATO AND SOVIET NAVAL AVIATION, 1949–89

MICHAEL NAPIER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From the Cockpit

Join one of Shuttleworth's newest pilots on his vintage flying journey

Each April, the arrival of Shuttleworth training week at Old Warden marks the end of winter hibernation for the collection's pilots and volunteers. I suspect I speak for many of us when I say it's one of the most anticipated events in our calendars — a chance to reconnect with great friends, refresh our vital flying skills, and generally gear up for the season ahead.

The week begins bright and early on Sunday with a full day of ground training. The programme covers everything from airfield changes and regulatory updates to technical and safety briefings, written tests and quizzes. By the end of the day, we're also able to get reacquainted with the different aircraft we'll be flying over the coming months by sitting in the cockpits and renewing our knowledge of the checklists.

Flying operations commence on Monday, and the schedule is always full. We usually start with the more straightforward aircraft, such as the Tiger Moth or the Chipmunk, which allow us to revisit core skills. These include stalling and spinning at altitude, followed by low-level display practices, approaches to all parts of the airfield and simulated engine failures.

Taxiing in at the helm of the Miles Hawk Speed Six after a successful display authorisation renewal. BEN DUNNELL

Tuesday typically moves into more advanced territory with aerobatics, formation flying and proficiency checks. In my case, the day began with early-morning aerobatics in the Tiger Moth, followed by my biannual proficiency flight in the Chipmunk with 'Dodge' Bailey. These so-called 'chop rides' can be daunting, but flying with 'Dodge' is always an absolute pleasure. You never land without having learned something new. That day, we combined the check flight with a trip to Duxford to attend the CAA's pre-season Flying Display Focus Group, before returning to Shuttleworth to complete the check, which I'm pleased to report I passed!

> *"Training week is one of the most anticipated events in our calendar"*

Wednesday brought more formation flying: barnstorming practice in the morning in the Southern Martlet, followed by a two-ship Miles Magister sortie in the afternoon alongside Simon Davies, chief test pilot at Vertical Aerospace. Later that day, I was fortunate enough to fly a solo practice display in the Desoutter, shortly after second-year Shuttleworth pilot Andy Monk completed his own conversion to the type.

Thursday was particularly memorable. All display pilots must renew their display authorisations annually, and for my renewal this year I flew the Miles Hawk Speed Six. This flight was slightly unusual, as I was being assessed by Mark Sharp — who was, in turn, being evaluated by the Civil Aviation Authority's Paul Szluha [see last month's '*Aeroplane* meets...' — Ed] for his own appointment as a display authorisation evaluator. I'm delighted to say Mark passed his assessment and is now the UK's newest DAE. I, in turn, renewed my DA for another 13 months.

As rewarding as the Hawk Speed Six is to fly, the true highlight of the day came later, when chief pilot Paul Stone gave me the opportunity to convert to one of the collection's most treasured aircraft, the Royal Aircraft Factory SE5a. This particular SE5a, F904, is the only surviving example with verified combat history, having downed a Fokker D.VII on the penultimate day of the First World War. But for that story, you'll have to wait until next month...

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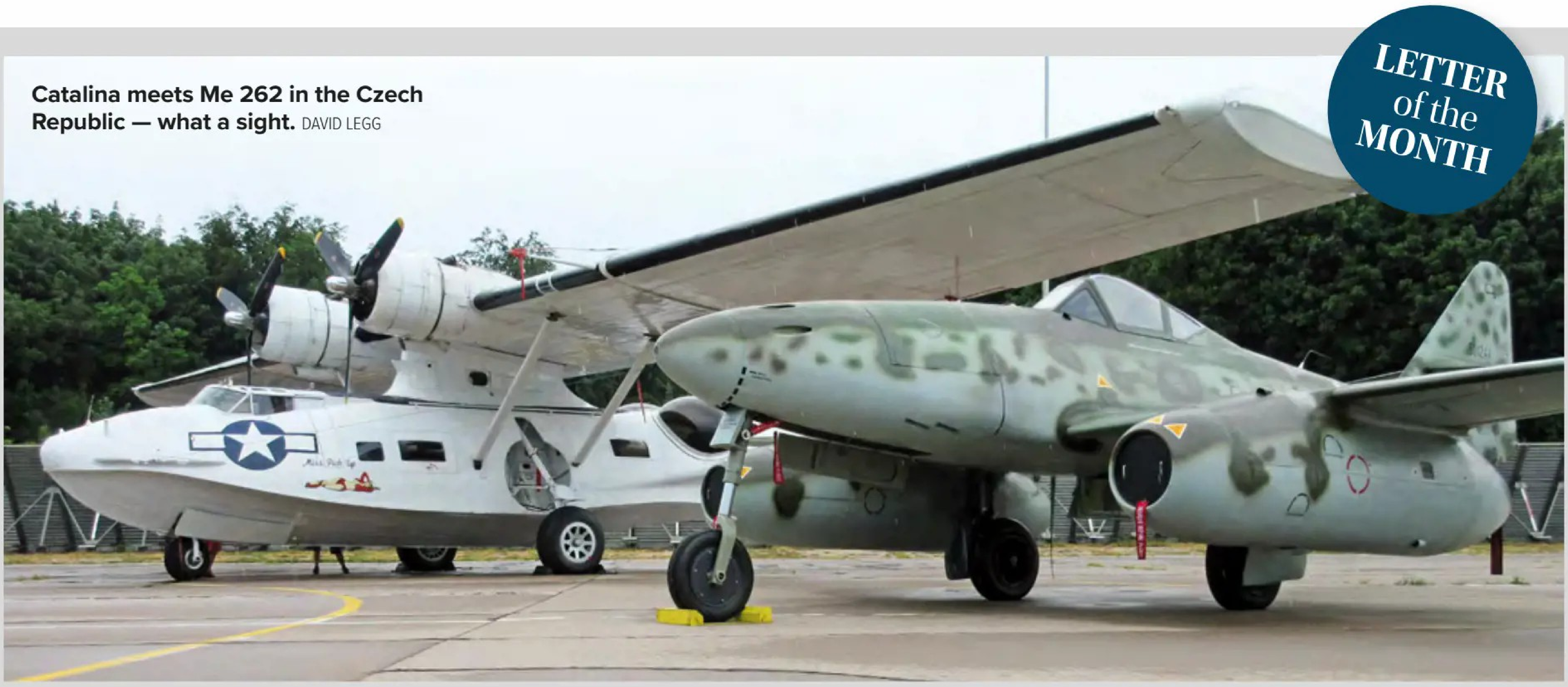
LETTER of the MONTH



Catalina meets Me 262 in the Czech Republic — what a sight. DAVID LEGG

I very much enjoyed Andrew Arthy's article 'Pick Up Artists' in the May edition. In it, Andrew mentions that two rescue motor launches were involved in the eventual rescue of OA-10A *Miss Pick Up*'s unfortunate crew. Although it was RML 498 which landed the crew at Great Yarmouth, readers may be interested to know that the senior officer of the other launch involved, RML 514, was one Patrick Troughton, later to become well-known as the actor who played the second Doctor Who in the BBC science fiction series of the same name.

The present-day *Miss Pick Up*, the Duxford-based G-PBYA, was involved in an impromptu re-enactment photo session in 2016 during a lull in the air display programme at Pardubice in the Czech Republic due to poor weather. Also there was the Messerschmitt Foundation's airworthy replica Me 262, D-IMTT, with pilot Gerhardt 'Geri' Krähenbühl and his crew. Upon being told about the 1945 encounter between the original *Miss Pick Up*, 44-33915, and a Me 262 of I./JG 7, the irrepressible Geri insisted on his aircraft being towed from one end of the airfield to the other so photographs could be taken of the two 'foes' together, some 71 years after the original encounter on the North Sea.

As an aside, 44-33915 was not the only Catalina to be destroyed by a jet. In June 1952, the Swedish Flygvapnet Tp 47 (a former RCAF Canso A) serial 47002 was shot down into the Baltic by a Soviet MiG-15 during the search for a missing Swedish Tp 79 (C-47).

David Legg

It was indeed sad to read on page 10 of the April *Aeroplane* that IWM Duxford was starting to move the Dove, Comet 4 and York outside. I understand the DAS ownership and all that, but, goodness me, Comet 4 G-APDB is so very special — crikey, it needs to be under cover. There are only two Yorks left, so again that aeroplane is very special. I do hope some sort of cover can be erected for the three of them; the little Dove won't need a lot!

Merv Crowe

Very good article — as always — in the May issue about the Saab Scandia, but you mentioned in passing something I found astounding. Apparently after landing in Dublin with members of the Irish government on board, while taxiing in "the nosewheel came off" a Scandia involved in a sales tour, but wasn't noticed by anyone. Really? Wouldn't that be a bit difficult to style out and pretend nothing had happened? Was it 'just' the tyre (bad enough), or the whole wheel (crippling, surely) or, worst of all, the entire strut assembly as well?

Intriguing. Hope someone has more information.

Steve Boston

Jan Forsgren writes: "That piece of information came from a lecture held by Claes Smith, and later summarised in a Swedish Aviation Historical Society magazine article. I agree it sounds quite incredible, and I was hesitant to include that paragraph. What I believe occurred was that the bolts securing the nosewheel came loose. Although the nosewheel apparently remained on the horizontal bar of the undercarriage fork, it would certainly have come off at high speed, resulting in serious damage."

Can I say how much I enjoyed your article about the 5th Emergency Rescue Squadron based at Halesworth, Suffolk (*Aeroplane* May 2025). Having written a history of No 24 Air Sea Rescue Unit at Gorleston, this had a particular resonance as the vessel involved came from this port.

First I must say the rescue was achieved by the Royal Navy, and not the RAF. The navy operated its Fairmile rescue launches in conjunction with the air force, these launches having better sea-going capabilities, greater endurance and longer range than the RAF high-speed

The late Patrick Troughton in Battersea Park dressed as Robin Hood, around the time he starred as the character in a children's TV series. This was March 1953, less than eight years after his involvement in one of the war's finest air-sea rescue operations. ALAMY

launches. The aviation aspects of the article are absolutely correct, but little reference is made to the actual pick-up, which was fraught with danger. The rescue was attempted over five days in atrocious sea conditions, and was one of the best air-sea rescues of the war.

A report by the late Lt Patrick Troughton, the senior naval officer at Gorleston, reads, "I was sent out as senior officer of the unit of 'Z' Boats (Naval Rescue Craft) in my own boat (RML 514) along with RML 498. We were told that a Vickers Warwick would rendezvous with us and drop flares to guide us to the American airmen in their lifeboat. About midnight I sighted a flare and succeeded in making contact with the Warwick which was coming in on the automatic transmitter in the lifeboat. By this time were well into the Heligoland Bight. We were told where the lifeboat was, but because of the high seas and the darkness we couldn't find it. I therefore decided to cut the engines and drift with the wind and tide until daybreak.

"At first light (April 4th) we sighted the lifeboat about a quarter of a mile on our beam. I signalled RML 498 which went in and made the pickup. Being too rough to take the lifeboat in tow, we (RML 498 and 514) opened fire and sank her. We returned to Great Yarmouth in the early hours of 5th April."

The rescue operation had lasted seven days and used all the resources of the air-sea rescue services: Royal Navy, Royal Air Force and the US Army Air Forces. The rescue aircraft, RAF and USAAF, had remained overhead on both 3 and 4 April, dropping flares and remaining in contact — and all this within 30 miles of the enemy coast.

A generous tribute was paid by the officer commanding the 5th Emergency Rescue Squadron to the commanding officers of both RML 514 and RML 498: "On behalf of my crews and myself, I would like to take this opportunity to express our deepest admiration to the Officers and Men who saved the lives of the Catalina crew in Heligoland Bight on 4th April 1945. Due to the adverse weather conditions and the sea conditions the courage and determination displayed by both Rescue Launches and Rescue Aircraft will long be remembered. We thank each and every one of those officers and men in one of the most daring rescues on record."

Tony Overill

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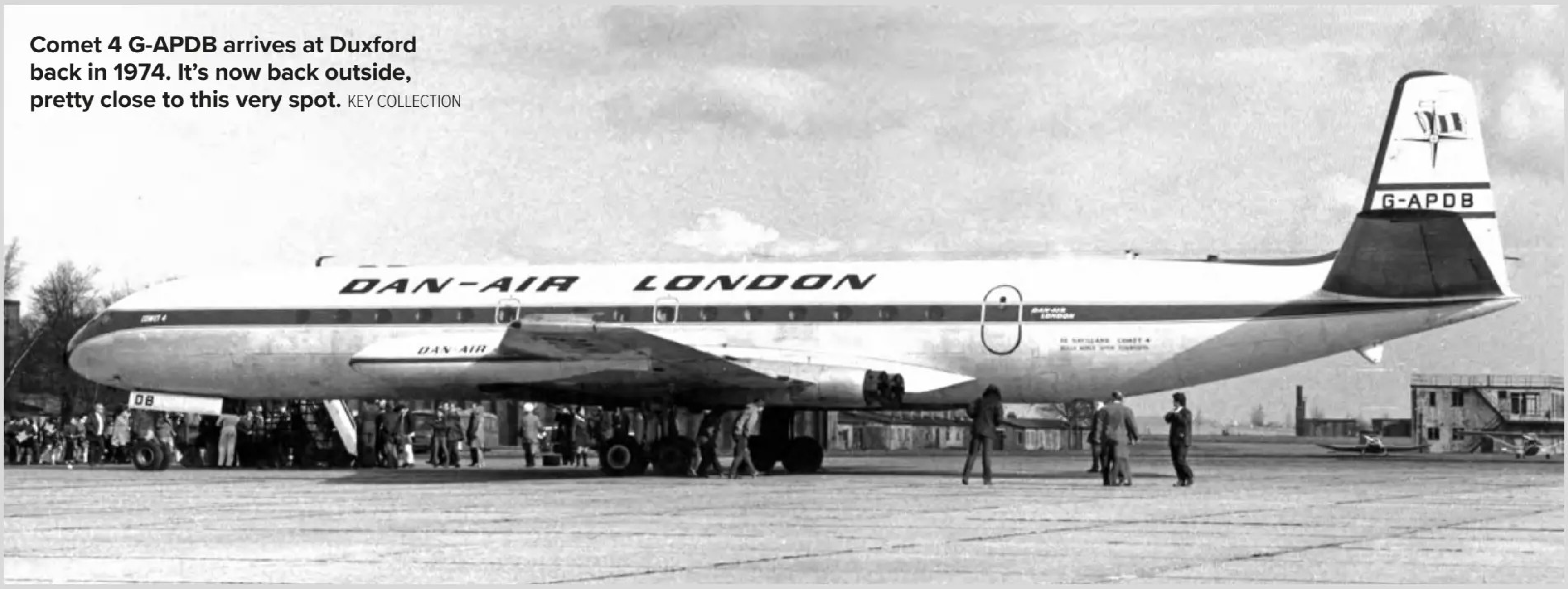

Comet 4 G-APDB arrives at Duxford back in 1974. It's now back outside, pretty close to this very spot. KEY COLLECTION

The reported news that DH Comet 4 G-APDB has now been taken from a hangar to an outside exhibition area at Duxford is tantamount to vandalism. I am sure museum politics surround the crass decision. The importance of historical items like this is the reason such museums exist. And the importance of 'DB is immense. Delivered new from the factory to BOAC in 1958, it operated the first ever commercial jet service across the Atlantic at 36,000ft with a speed of Mach 0.78, opening up jet travel which has become the norm.

After operating with BOAC, G-APDB went to Dan-Air as part of the new revolution in affordable, all-inclusive package holidays plus charters, making flying a means of rapid, long-distance travel for everyone possible. It has therefore been a pivotal machine in two major developments in commercial aviation.

'DB was flown in to Duxford as a gift from Dan-Air, remaining outside as a public exhibit for a few years and sadly deteriorating. Volunteers put an immense amount of effort and money into restoring the Comet into its current excellent standard, it eventually, as a necessity, being hangared. The decision to move it outside again is beyond comprehension.

Could I ask that the decision to relocate these seriously historic and one-of-a-kind aeroplanes be revisited? They not only represent the products of excellent aircraft companies, now all gone, but the immensely dedicated, brilliant staff who created such masterpieces.

I declare a personal interest in 'DB. I flew it many, many times as a Dan-Air pilot.

Geoffrey New

Q&A

COMPILER: BARRY WHEELER

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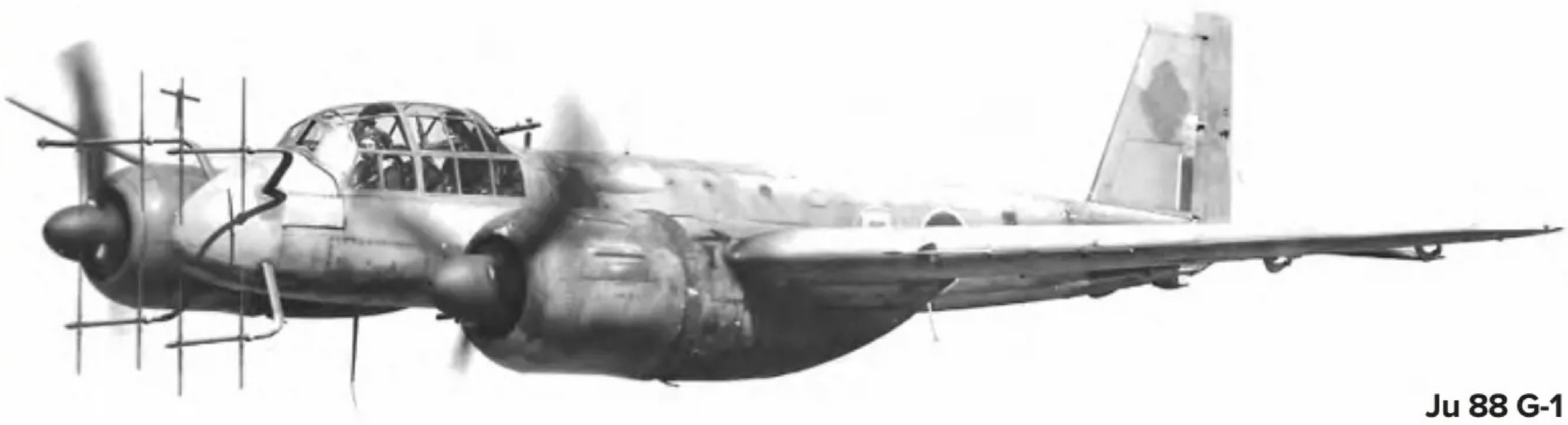
THIS MONTH'S QUESTIONS



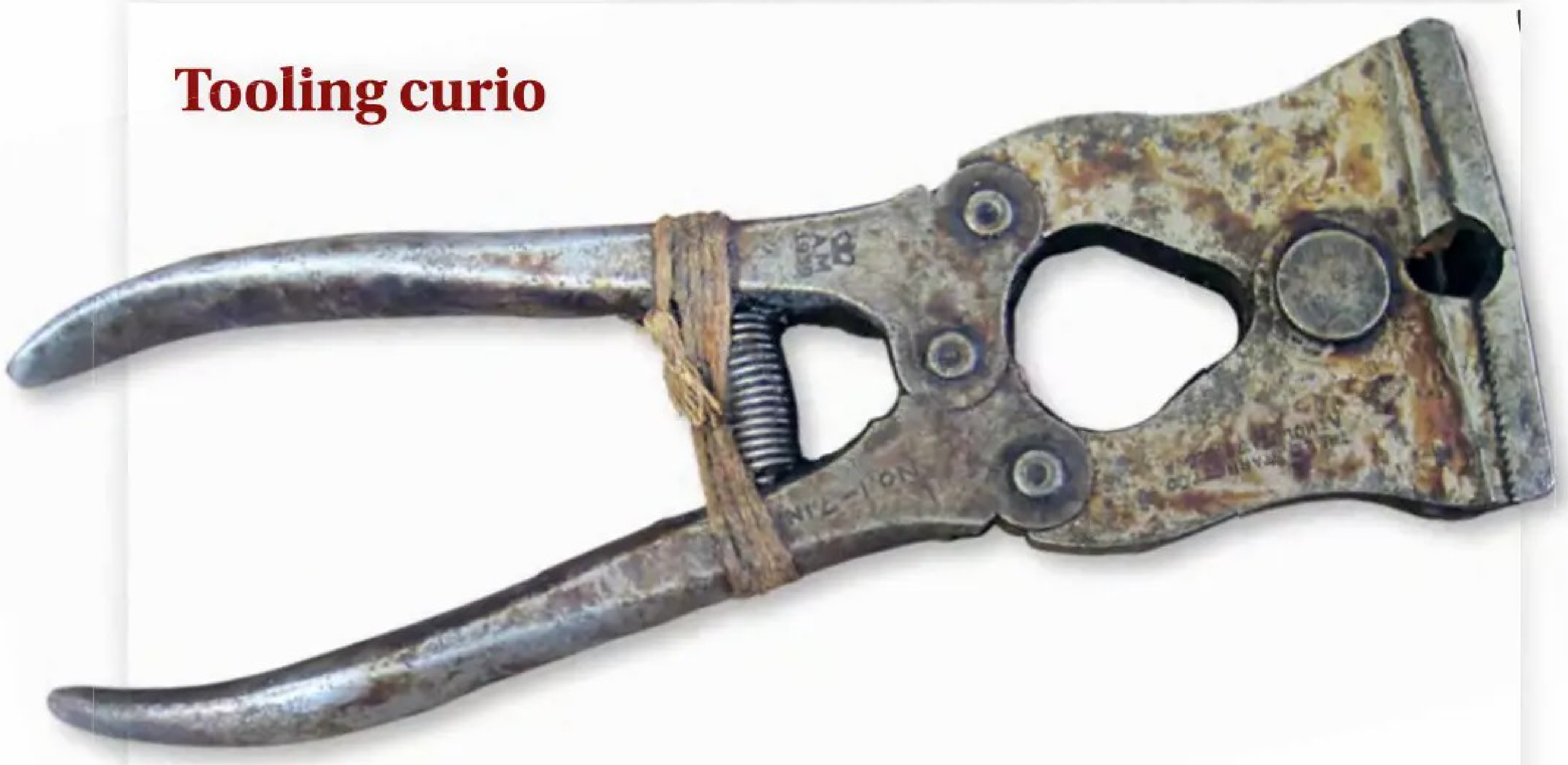
Ju 88 G-1 Werknummer 712273 flying with the RAE as TP190.

VIA BARRY WHEELER

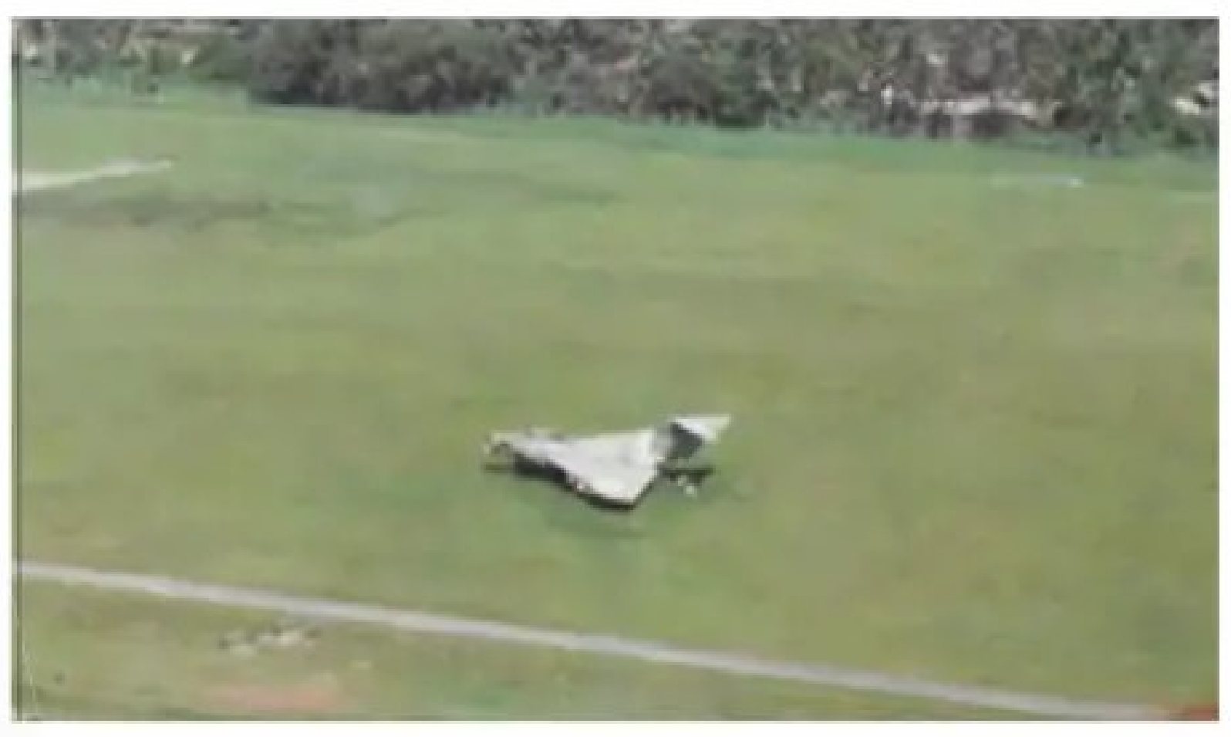
Woodbridge Ju 88 fate

Q Contributor David Halford is trying to discover more about the fate of the widely known Junkers Ju 88 G-1 night-fighter Werknummer 712273, which landed by mistake at RAF Woodbridge on 13 July 1944 and flew at Farnborough as serial TP190. The aircraft revealed valuable information on the radar equipment which was taking a steady toll of RAF bomber crews, and after extensive trials it was displayed in the static park at the German Aircraft Exhibition at Farnborough in November 1945. Soon afterwards it's believed to have been scrapped, but David is keen to find out precisely when this was and whether any part of the airframe survived as his wife, Elizabeth, has got to know the daughter of the Ju 88's pilot, Obgfr Johannes Maeckle.

Tooling curio



Q Francis Hanford, curator at the Trenchard Museum, RAF Halton, is hoping someone can identify this unusual tool which came into the museum's possession among the effects of an ex-Halton aircraft apprentice who rose to the rank of warrant officer prior to World War Two. It was made by the LS Starrett Company of Athol, Massachusetts, and bears an Air Ministry symbol. Wrapped in its original greaseproof paper, it appears to be a form of crimping device, but close inspection of the jaws reveals what seems to be a blade, and why the machined surface as part of the head? Does anyone recognise it?



The unmistakable shape of the Tengah Javelin.

Tengah Javelin

Q In 1976-78, Mike Wicksteed was posted to HQ NZ Force in Singapore and occasionally visited No 41 Squadron at Tengah where, at the end of runway 36, there was a Gloster Javelin which hadn't attracted the attention of the fire-fighting teams. As the last operational Javelins in South-east Asia were those of No 60 Squadron which disbanded in April 1968, why was this airframe left, what was its serial and how long did it survive on 'a foreign shore?'

THIS MONTH'S ANSWERS

Cub at Gatwick

Q In the May issue, Colin Ford responded to a request in the January copy from Christopher Harris regarding aircraft at Gatwick in the initial post-war years. The subject concerned a Piper Cub floatplane.

A Peter Marson responded that he doubted the aircraft flew again. He says it was stored at Gatwick for several years and then moved to Hants & Sussex Aviation at Portsmouth where Peter saw it in a dismantled state in January 1957. Its move from Gatwick was probably due to the clearance effort initiated around the pre-war hangars and the old 'Beehive' terminal. The Cub, registered N98887, was subsequently broken up for spares.

Mojave Messerschmitt

Q David Knapp of Fredericksburg, Virginia photographed a Bf 109 during a July 2001 visit to Mojave Airport, California, and wondered what had happened to it.

A We can give David an easy, instant answer to this one: the aircraft is Bf 109 E-7 Werknummer 3579, which was then part of David Price's Museum of Flying collection at Santa Monica. After a period with Ed Russell in Canada, it's now in the UK at the Biggin Hill Heritage Hangar.

Bf 109 E-7 Werknummer 3579 being fettled at Mojave.

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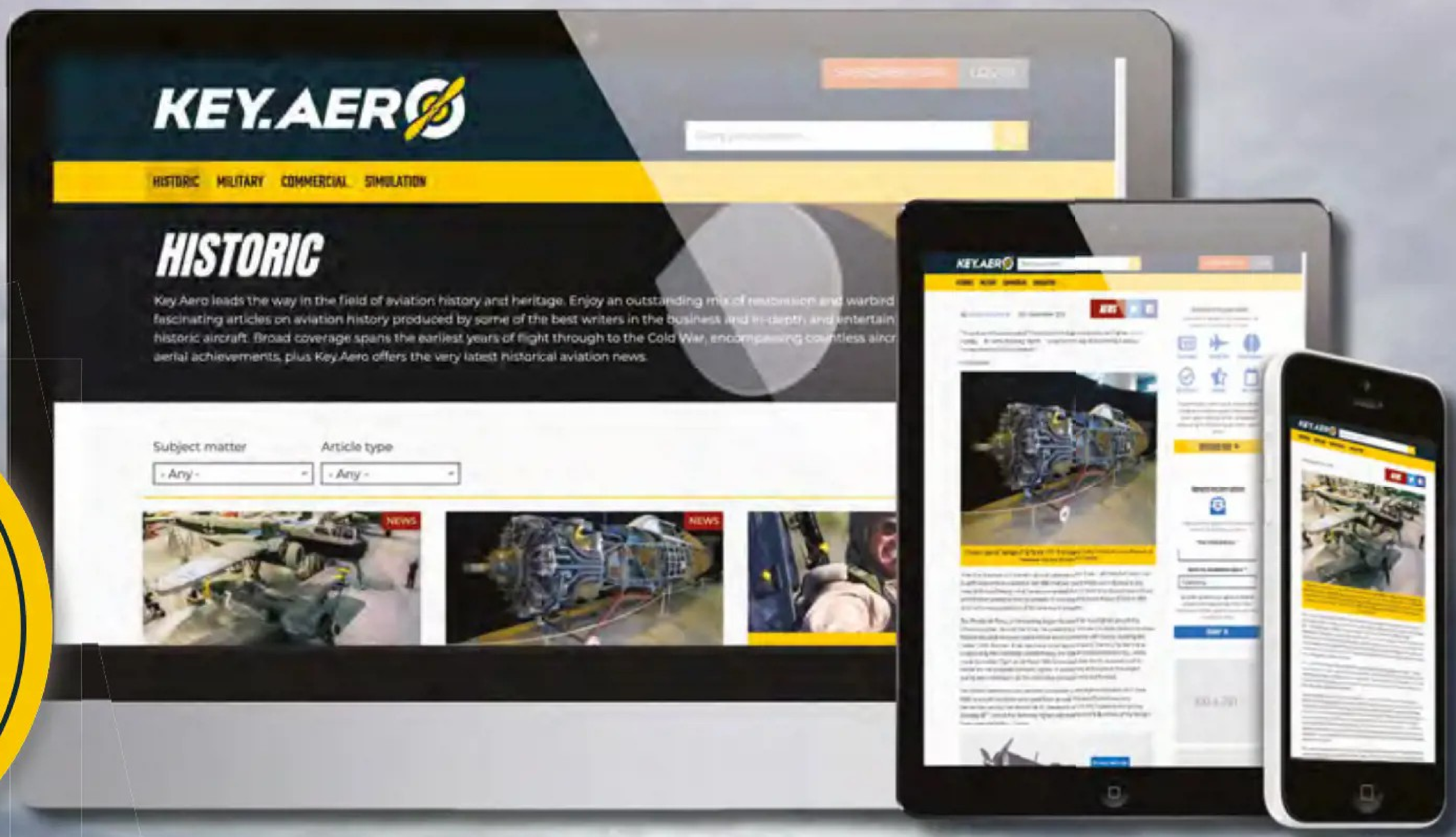
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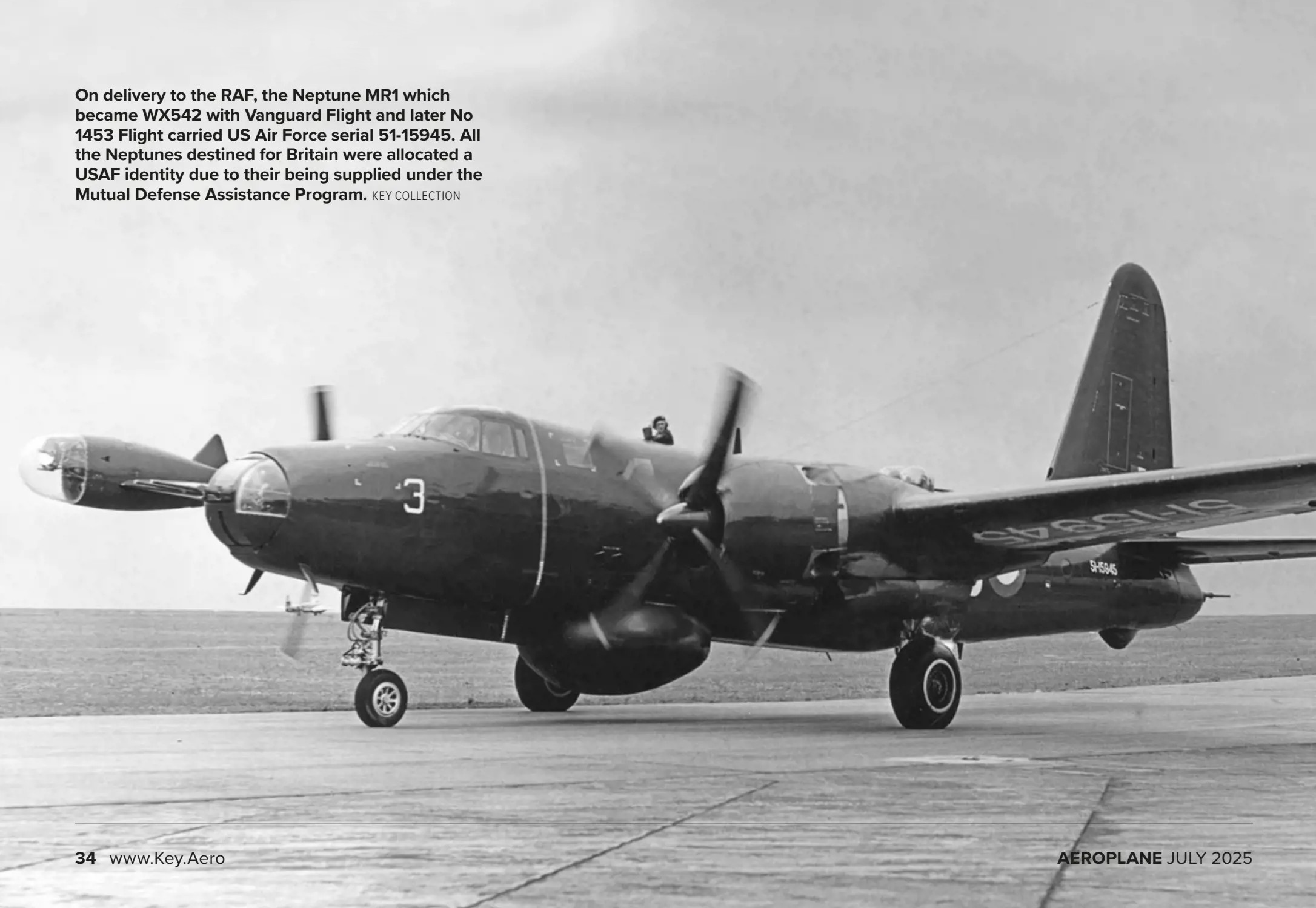
IN THE VANGUARD

The Lockheed Neptune wasn't in RAF service for long, but its part in the service's Cold War history shouldn't be overlooked — and in giving the air force an airborne early warning and control asset of its own, it was crucial as a means of developing how the role could best be used as a central component of Britain's air defences. This is the seldom-told story of Fighter Command's Vanguard Flight and No 1453 Flight

WORDS: BEN DUNNELL



On delivery to the RAF, the Neptune MR1 which became WX542 with Vanguard Flight and later No 1453 Flight carried US Air Force serial 51-15945. All the Neptunes destined for Britain were allocated a USAF identity due to their being supplied under the Mutual Defense Assistance Program. KEY COLLECTION

ABOVE: **Provision of the Neptunes — this one is WX495, which served in the maritime role with No 217 Squadron and No 236 OCU — helped hold the line until sufficient Shackleton MR1s were available to Coastal Command.** CROWN COPYRIGHT

It was, as they say, a good innings. From the closing stages of the Pacific War to the early part of the post-Cold War world, the AN/APS-20 radar equipped the front line of some of the most powerful air arms, taking the airborne early warning and control role from infancy to maturity. Certainly, it represented a favourable return on the investment made by the Radiation Laboratory of the Massachusetts Institute of Technology when the Japanese kamikaze threat was approaching its height, and new means of detecting the approach of low-flying aerial targets became a priority. So it was, through the AN/APS-20 installation, that Britain properly got in on the act. What wasn't in the plan was for that same radar to still be employed four decades later.

The platform on which it was used by that stage was the Shackleton AEW2, the final derivative of Avro's famed maritime patroller. It was intended to be an interim measure, plugging what would today be called — to use one of those dreadful buzz-phrases so beloved of modern leaderships — a 'capability gap' until a truly modern AEW aircraft became available. That it had to last from 1972 until 1991, and the very belated arrival of the Boeing E-3D Sentry, is a whole other story. But the Shackleton chapter saw the Hazeltine/General Electric-manufactured AN/APS-20 radars from the Royal Navy's retired Fairey Gannet AEW3s being transferred into the Avro aeroplane; the type of radar that had equipped Britain's first post-war AEW assets.

In getting into the Cold War airborne early warning game, the RN was ahead of the RAF. It started inducting the Douglas Skyraider AEW1 into service during 1952, providing cover for the fleet. However, the air force — which had conducted AEW trials with various Vickers Wellingtons during the war — didn't lag far behind, and its solution likewise came in an American-built form.

Again, in a theme common to this story, the aircraft in question was meant to fill a hole. Shackleton deliveries would not be able to keep pace with Coastal Command's growing commitments, so the US Mutual Defense Assistance Program stepped in to supply 52 Lockheed P2V-5 Neptunes for the maritime patrol role. Known to the RAF as the Neptune MR1, an initial pair arrived at St Eval, Cornwall, on 27 January 1952. They entered service with No 217 Squadron, shortly to move north to Kinloss, Moray. Four squadrons would be so equipped, split between Kinloss and Topcliffe, North Yorkshire.

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Now a new opportunity presented itself. With only minor modification and a cadre of specially trained operators, the AN/APS-20 search radar used by the maritime Neptunes could be put to use for AEW. That much was already being shown by the navy's Skyraider AEW1s, which were so equipped. The RAF — whose Central Fighter Establishment had just reported on AEW work with a US Navy Boeing PBW-1, a modified B-17G Flying Fortress — saw the role as being Fighter Command's preserve, not Coastal's, so the initial trio of aeroplanes was transferred to its inventory during November 1952.

Neptunes WX499, WX500 and WX501 joined a newly formed unit, Vanguard Flight, stationed at Kinloss as part of No 12 Group. Commanded by Sqn Ldr Frank Brinsden — a New Zealander who had flown Spitfires with No 19 Squadron at Duxford, coincidentally also within No 12 Group, during the Battle of Britain — its purpose, as stated at the time, was to carry out operational trials "in order to gain experience with, and to test the effectiveness and practicability of airborne radar against low flying aircraft". They would also allow evaluation of the "capabilities and limitations" of the AEW fit in the Neptune, and permit recommendations to be made as to how AEW could be integrated into Fighter Command's control and reporting system.

First the crews had to be trained, a process undertaken from Kinloss by No 236 Operational Conversion Unit and No 217 Squadron.

ABOVE: WX500 in use with No 1453 Flight circa 1955, following its return to service having had repairs to serious damage sustained in a landing mishap.
VIA ANDREW THOMAS

Flying instruction on type began in early December, and two crews had been converted by the end of the year, the third following in March as the captain was still posted elsewhere. By then, on 12 January, Vanguard Flight had been made completely independent of the OCU, to which its aircraft had been temporarily loaned. Brinsden wrote to the Air Officer Commanding No 12 Group, AVM Richard Atcherley, "My one fear in starting operational trials too soon is that we may produce false results through inexperience both in servicing and operating, which will damn the project before it has a fair chance". Prescient words, as it turned out.

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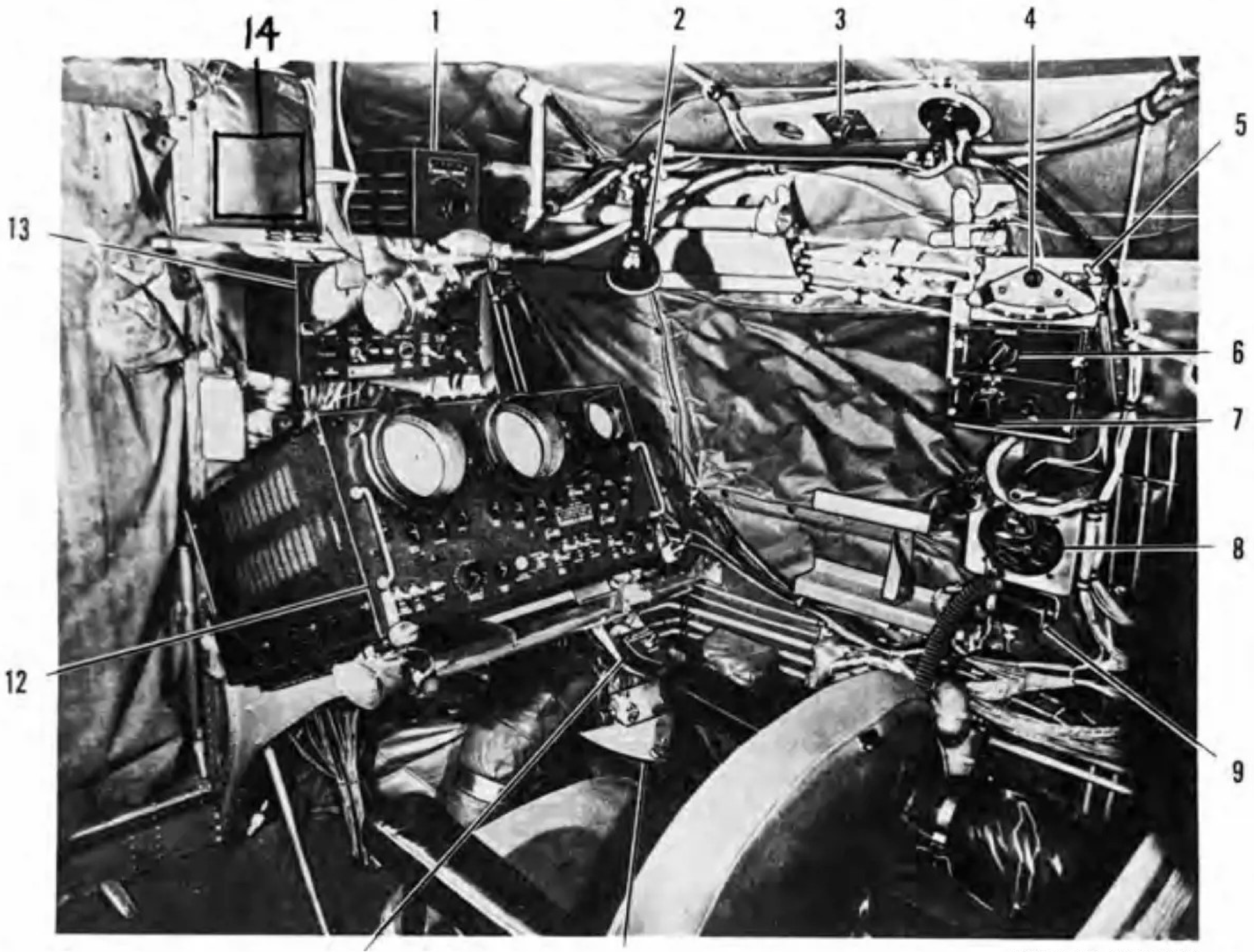
As for the radar operators, 14 personnel received tuition "largely from an officer with AEW experience seconded from the Royal Navy". This was where early problems set in. Those drawn from airman ranks were found, the trial report said, "most unsuited to their new role", and would be suspended after just "two or three months", leaving just two officers and two senior NCOs. Eventually it was concluded that prospective trainees would be better off receiving preliminary briefing on the AN/APS-20 and its limitations, but for the moment the four remaining operators were able to take part in airborne missions and allow the programme to move forward. There were four sorties in all: setting-up practice, further setting-up and simple coastal navigation, ship homing and elementary aircraft observation. With the experience thus gained, it was possible to carry on to the operational training phase and train further radar operators as replacements for those who didn't make the grade.

An interlude while a detailed trials directive was prepared gave Vanguard Flight the chance to hone its operating techniques. Specifically, the training flights had identified the need to "establish

INSIDE THE AEW NEPTUNE

An AN/APS-20 radar operator's position inside a Vanguard Flight/No 1453 Flight Neptune, as annotated to accompany the AEW trial report

1. AN/APS-20 auto-transformer
2. Flexible light
3. Flexible light rheostat
4. Inclinometer
5. AN/APS-20 Xtal light switch
6. Console light rheostat
7. Intercom control box
8. Oxygen regulator
9. Interphone jack box
10. Ventilation diffuser
11. AN/APS-20 AE speed regulator
12. AN/APS-20 console
13. Meter box
14. AN/ART-26 radar relay transmitter



NATIONAL ARCHIVES

the effect of height variations by the AEW aircraft on the ranges obtained on standard aircraft targets" — in other words, to ascertain the altitudes at which the Neptunes should fly, always over the sea, in order for the radar operators to best pick up an aircraft on their scopes. It proved an interesting, if fraught, task.

The first such trial on 23 April 1953 involved six Leuchars-based Meteor F8s flying east of Fife Ness in sections of two, maintaining 300kt and 300ft. For the initial pair, the Neptune was at 1,500ft, climbing on the subsequent occasions to 2,500 and 3,500ft. It was intended to obtain six pick-up and fade ranges at each altitude. However, despite the operating area being specifically chosen to mitigate against this issue, the Meteors lacked sufficient endurance to make the planned number of runs.

What results were gathered in the course of a six-hour 20-minute Neptune sortie proved "generally disappointing". The 1,500ft test was "virtually abortive", just "a few isolated 'paints'" being seen on the radar display, and when there was no joy at 2,500ft either the decision was taken to drop back down to 1,500, "in an endeavour to obtain at least some figures from the trial". Eventually the average pick-up range was 37nm and the average fade range 45.5nm. Prior estimates had suggested a pick-up range of around 50 miles for a fighter and 80 miles for a large aircraft, such as a Tupolev Tu-4 'Bull', the Soviet copy of the B-29.

Why had the outcome been so poor? "The presence of much shipping and a fairly large sea return" was at the top of the list, followed by stratus cover at roughly the targets' altitude, bumpy conditions on the last two flights, the Neptune pilot's heading corrections and its nose-up attitude caused by maintaining 150kt in a heavily laden aeroplane. And it all had to be viewed in the context of the AEW radar operators still being fairly inexperienced in the use of the equipment, which certainly had its shortcomings. The points about aircraft attitude, course and the effects of turbulence all mattered, because the AN/APS-20's scanner was not stabilised laterally or longitudinally, and if its beam was deflected too far, contacts would not be picked up.

Vanguard Flight tried again on 4 and 14 May 1953, patrolling east of Fair Isle so as not to pick up so much radar clutter from shipping, and using another Neptune as the target since it would be easier to detect and track than fast-moving fighters. Now results started to improve. The first of those two sorties was "very successful", with "almost unbroken" tracking on all runs and "fairly consistent" ranges, at their best at 3,500ft where the averages were 69nm for pick-up and 58nm for fade. That the pick-up ranges proved better was "generally contrary to expectations". The best range of all was a 73nm pick-up, which improved the 3,500ft average. It occurred when the target Neptune was in a turn and "momentarily" presented itself from beam-on, not head-on or tail-on.

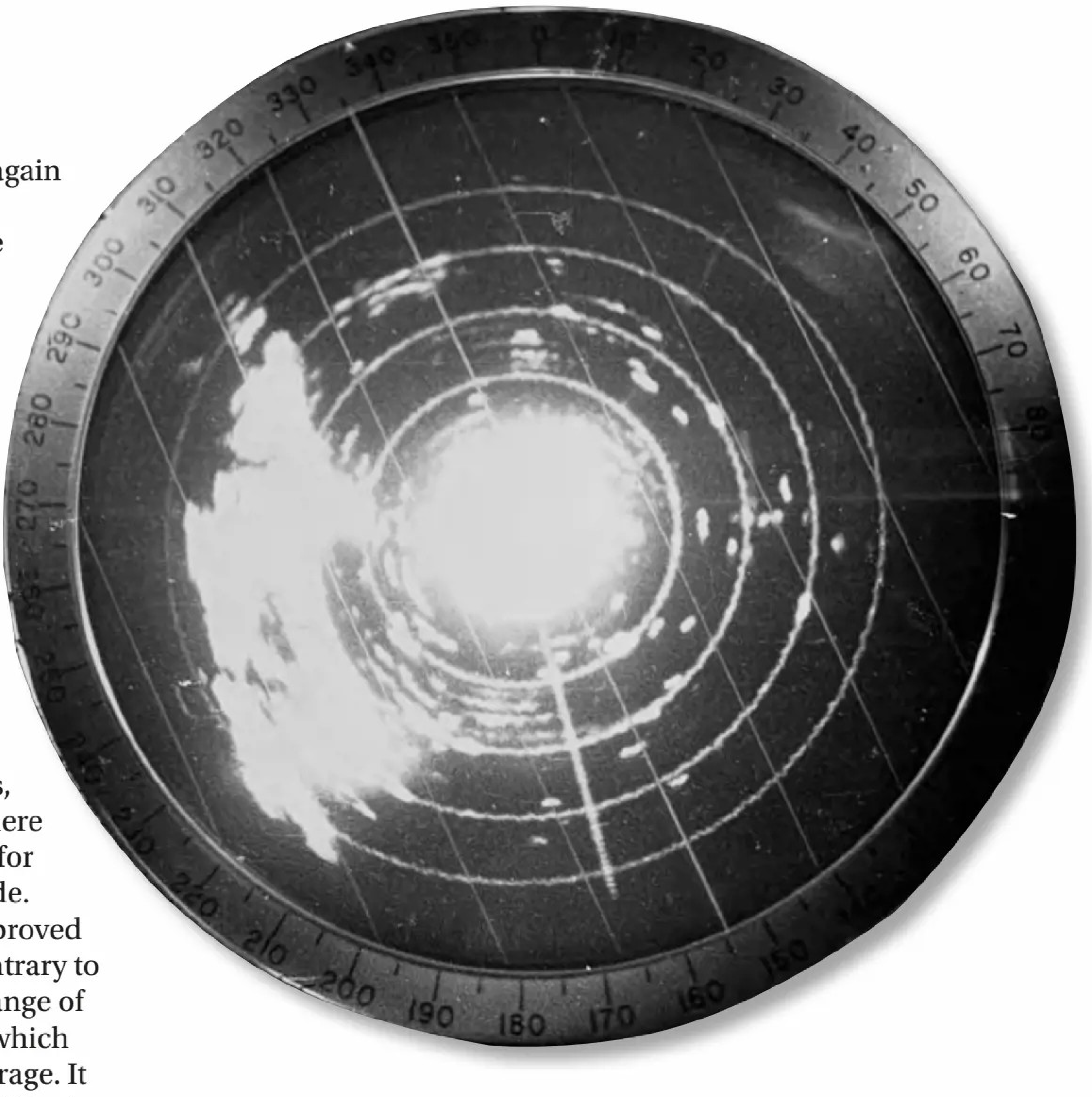
To some extent this was all a bit anomalous, as the second sortie with the Neptune target proved. The ranges were somewhat less, but more in line with expectations — and, indeed, later experience — as the fade ranges were superior to the pick-ups, and flying at 3,500ft brought inferior results to those from the two lower levels. "The advantage of a possible small increase in pick-up gained by flying higher", the report noted, "would usually be far outweighed by an increased area of sea return reducing the amount of clear tracking space available". Overall, having the aircraft maintain a "near zero fore and aft attitude" was felt to be the most important factor in the improved ranges.

> *"No contacts whatsoever were made with the Sabre targets"*

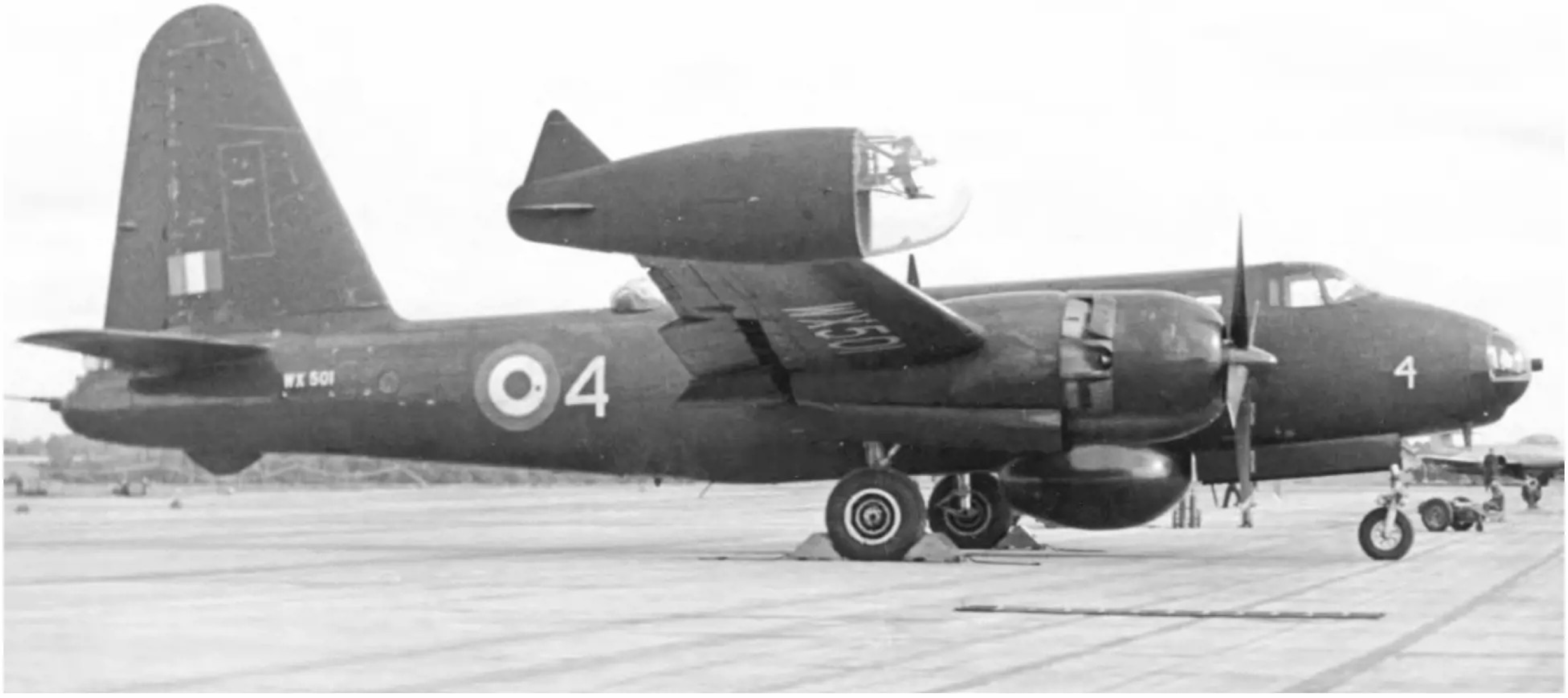
Reverting to Meteor targets from Leuchars, this time NF11s, attention was paid to keeping the Neptune in a constant attitude. This flight on 20 May was a long one, seven hours 20 minutes in duration, and it ended with the "complete failure" of the AN/APS-20 transmitter. But average pick-up and fade ranges were identical, at 39nm from just 900ft, leading to the conclusion that when fighter-type targets were involved there "appeared no advantage" in operating above 1,500ft.

The start of operational trials brought three flights, during which either synthetic or live plots of a Neptune target were passed to the Fighter Command Eastern Sector ground station at Hopton-on-Sea, Norfolk. All the results "confirmed the earlier figures", giving a circa 15 per cent increase in range if the AEW Neptune flew at 1,500ft instead of 1,000.

On 5 June 1953 Vanguard Flight was disbanded and redesignated more conventionally as No 1453 Flight, at the same time moving from Kinloss to Topcliffe. Exercise 'Momentum', a major test of the UK's air defences held from 14-23 August, was intended to mark a milestone. The hope during the AEW trials was that the flight "would have reached a sufficiently advanced stage in training and experience to participate to the full in its primary role". But through June and July there was "a marked decline" in AN/APS-20 serviceability. Flying along a patrol line off the Norfolk coast, with pairs of Meteor



ABOVE: The AN/APS-20 display in an AEW Neptune, as captured during a sortie on 17 August 1954, illustrating the effects of 'jitter' caused when the aircraft's engines were running above a certain rpm setting. There is a pronounced ripple on the circular range markers, while the returns from ships were wavy and often broke up.
NATIONAL ARCHIVES



ABOVE: WX501 was one of the two aircraft which remained on strength with the flight throughout its existence. Each of the Neptunes received an individual code number, this one being 4; three different aeroplanes sported 3 owing to mishaps suffered by two of them, while it's not known why there was no number 1. There is a source stating that WX498 was coded 1, but this airframe is not otherwise recorded as being used by the AEW unit.
VIA ANDREW THOMAS

F8s and North Luffenham-based Royal Canadian Air Force Sabres as targets, sorties on 16 and 21 July were notably unproductive. Indeed, on the second of those occasions no contacts whatsoever were made with the Sabres, the radar also showing signs of electrical interference. While it was not "entirely unserviceable", the equipment "seldom attained the high degree of sensitivity demanded by the AEW role."

What, exactly, was the problem? Evoking memories of the project's early days at Kinloss, it was put down to "insufficient spares backing and a total lack of the test gear essential to the production of maximum efficiency" in the radar. Work on the AN/APS-20 units was being carried out in the main by just one corporal with minimal specialist facilities. Involvement in 'Momentum', it was felt, would bring "little benefit" to either No 1453 Flight or the Fighter Command sector defences.

Then an improvement in radar serviceability and the keenness of the crews led to a volte face. Two of the three Neptunes were allocated to Eastern Sector, as a means of training as opposed to being part of the trials. Should the results prove poor, "they would not be allowed to prejudice the future of the project in any way". The event didn't prove a conspicuous success. Used "for maximum effect in those periods of the exercise during which low level activity by the attacking forces was anticipated", seven of 13 planned flights were carried out — in part due to aircraft unserviceability — and "few results were obtained", not a great return for 71 hours 30 minutes of flying. With full test gear facilities still not at No 1453 Flight's disposal, the radars were not performing at their best.

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Yet it was far from a waste of time. A "considerable amount of valuable experience resulted", especially in relation to operator fatigue on long patrols. Making steep turns at the end of a patrol line caused airsickness and detracted from the value of rest periods taken by the radar operators in the rear of the aeroplane. Those so affected did not prove effective again without at least 12 hours' rest on the ground. More generally, "the standard of set operating and the ability to concentrate did drop off towards the end of the patrol period". One sortie having lasted 10-and-a-quarter hours, of which more than eight were spent on the patrol lines, 'Momentum' had tested this aspect of AEW operation like never before.

With a bit more optimism about the radars, No 1453 Flight launched back into its operational trials. It didn't persist. The Neptune planned to fly on 1 September had received work on its radar set, but an aircraft technical fault grounded it. A less stringent radar check had been made on the back-up aeroplane, and the sortie was

THE AEW NEPTUNE FLEET LIST

RAF serial	Code	Remarks
WX499	2	With unit throughout
WX500	3	Suffered "accident after landing" at Kinloss 20 April 1953, without injury to crew; sustained Category 4 damage and noted in operations record book as "awaiting disposal", but repaired and returned to unit 11 June 1954
WX501	4	With unit throughout
WX542	3	Arrived late April 1953 as replacement for WX500; crashed on landing at Topcliffe 15 January 1954, with no crew injuries, and written off
WX547	3	Arrived from Kinloss 26 March 1954 as replacement for WX542; left 11 June 1954 for No 36 Squadron on return of WX500

"completely abortive". Two days later, the primary Neptune was fixed, only for turbulent weather to diminish both radar and operator effectiveness. Even so, the AN/APS-20 was still not working well.

Another break in the programme was enforced by the need for the two short-nosed Neptunes to return to the US for modification by the Emerson Electric Company of the ventilation system on the Aero 9B front turret. WX499 arrived at Lambert Field, St Louis on 13 September, and should have soon been followed by WX501, but its transit was significantly delayed, not least by Category 2 damage caused in a number one engine fire during continuation training. It made the crossing in early December, its crew flying WX499 back. The opportunity was taken by No 12 Group to assign No 1453 Flight to Northern Sector, affording closer liaison with the sector headquarters, reducing "the amount of non-productive flying time" involved in transiting to Eastern Sector's area, and spreading the burden of providing targets out more evenly. Bempton, on the Yorkshire coast, now became the receiving station.

Activities resumed on 5 January 1954 and continued at regular intervals until the end of the month. With the radars generally functioning, this proved to be a productive spell in spite of bad weather and choppy seas below. Over five flights, the Neptunes achieved an average pick-up range of 39.75nm for Meteor targets on three quarters of the occasions "when detections were considered feasible."

The 12 January sortie involved an innovation: "the attempt to intercept targets between the patrol line and the coast, from the plots passed by the AEW aircraft". This did not form part of the official trial, but "a certain measure of success was experienced". Above all, it demonstrated how AEW platforms might in future be more fully integrated into Britain's air defence structures.

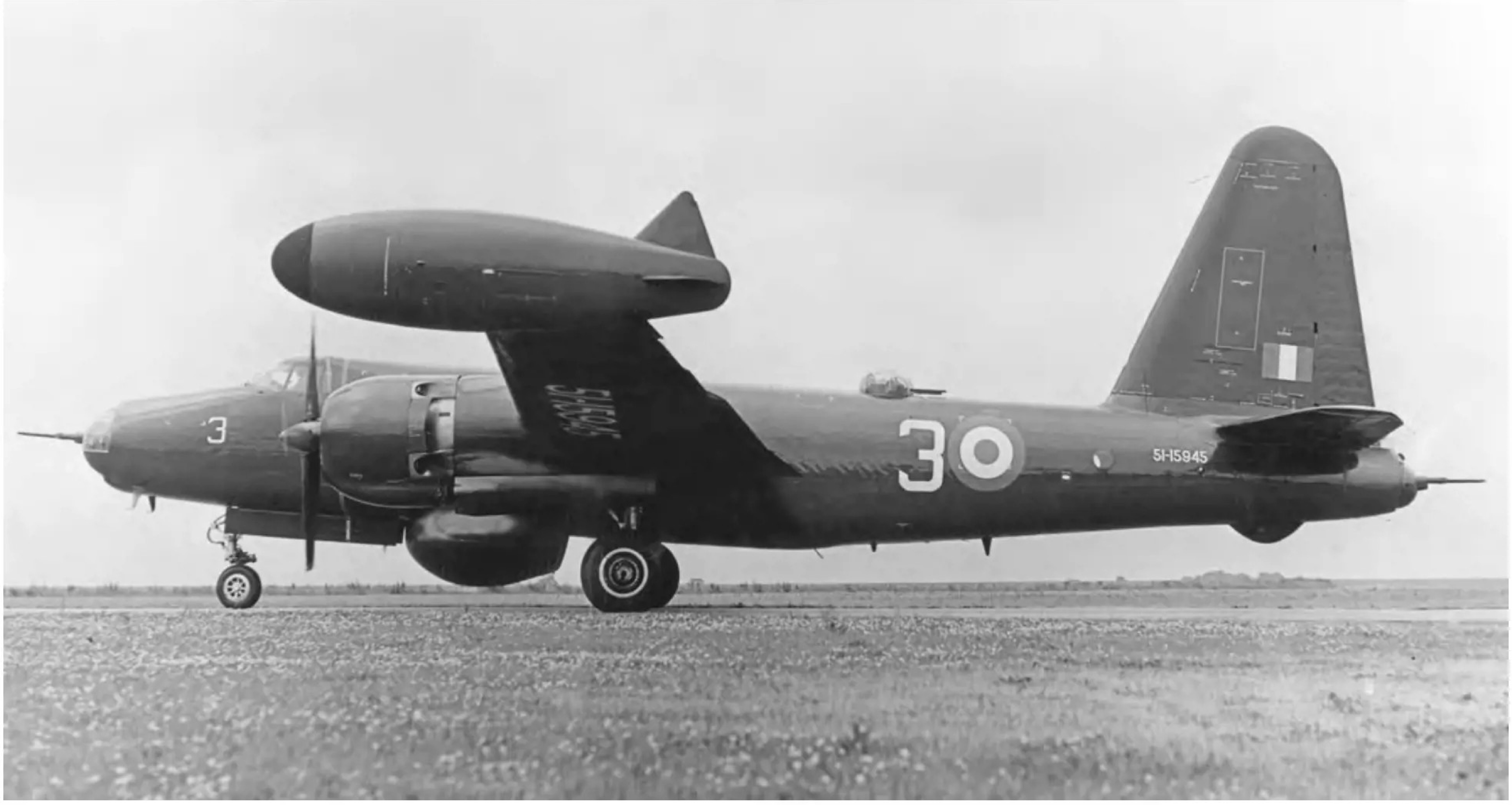
> ***"The Neptunes' radars were still not performing at their best"***

Far less positive was the loss — thankfully non-fatal — of Neptune WX542. Delivered to No 1453 Flight in April 1953, it only lasted until 15 January 1954. While flying a crew training detail, it stalled on approach to Topcliffe and hit a mound, becoming the first of the type to suffer a major mishap in RAF use. The airframe was damaged beyond economic repair, but the outcome could have been much worse. Since a crew had only flown to St Louis to collect WX501 the day before, just WX499 was now available. Not until late March was WX547 added to restore a three-strong fleet.

On into stage three, had a corner been turned? It certainly seemed like it. The objective now was to enable better continuity of tracking, to which end two pairs of fighter targets were "synchronized to pass through the patrol area together", subsequently increased to three pairs. In more favourable conditions from March into May, and with the AN/APS-20 radars "up to the desired standard for AEW operating" on 75 per cent of flights, "no difficulties" were found in tracking these increased numbers of targets and there was "considerable improvement" in pick-up ranges, now up to 45nm for Sabres, 55nm for Meteors and 65nm for a single Canberra. "Weather remained the chief enemy of successful AEW operation", though, while there were issues with the handover of targets to ground stations.

Perhaps the biggest obstacle was now being created by the

BELOW: The Neptunes that originally went to Vanguard Flight — as per WX501 on the opposite page — were delivered with the short, 20mm cannon-armed nose incorporating the Aero 9B turret, a mid-upper turret containing two 0.50-calibre machine guns, and a 20mm cannon in the rear turret. WX542/51-15945 on its arrival had the longer Aero 9C turret nose, which was later the subject of a retrofit to WX499, at least, in October 1955. KEY COLLECTION



aircraft themselves. Fighter Command wanted to investigate the possibility of having two AEW aircraft flying parallel patrol lines, thus providing better low-level interception and warning provision over a larger area of the coast. As soon as No 1453 Flight heard of this proposal, it "felt that it would be most difficult to fulfil", since average Neptune serviceability was down to just one of the three on strength now WX547 had arrived. It tried to provide two serviceable aircraft for normal and radar continuation training throughout the trials period, but this "met with success on a limited number of occasions only". What was more, when airborne with the Wright R-3350-30W Duplex-Cyclone radial engines running at more than 1,900rpm, the radars were now suffering from a "persistent low frequency ripple, generally referred to as 'jitter'."

Not ideal circumstances, then, in which to proceed, but the flight made Neptunes WX499 and WX501 active, and conducted the trial on 7 October. It did not succeed. "Although the AEW Neptunes were at all times able to see each other on the radar", said the report, "nothing was seen of any of the fighter targets by either of the reporting aircraft". In the final analysis, "it was thought reasonable to assume that the failure was caused by sub-standard radar which gave ranges of about 30nm on a Neptune target, but rather less on the Meteors, which in consequence would have been in the AEW 'bog' by the time they had reached a range at which they could have been detected on a clear tube."

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The difficulty in making more than one No 1453 Flight Neptune available at a time led Fighter Command HQ to state that no further parallel patrol line trials should be flown. Instead, attention switched to the AN/ART-26 radar relay link in the aircraft and the associated AN/SRR-4 terminal equipment at Bempton, which would allow the ground station to see the radar picture available to the operators in the aeroplane, rather than passing this information by other means. An inaugural sortie on 15 July brought "little success", after which various factors caused a break of three months. On resumption, the link "generally proved to be satisfactory", it being possible to present Bempton with a "continuous picture" at ranges of 25-35nm away. Not much, but it was a start. The Royal Navy and US Navy had already switched to the AN/ART-28 datalink, which afforded greater range.

Its time with the RAF was necessarily short, but the Neptune — the identity of this one is not known — afforded significant advancements in both maritime and AEW capability, at a time when no other suitable modern platform was so readily available. KEY COLLECTION

In general, it was felt "the relayed picture [...] would be a workable presentation from which to carry out the interception of aircraft targets". This was trialled on 2 December, in conjunction with Meteor NF14s from No 264 Squadron at Linton-on-Ouse. But the AN/APS-20 played up, and so did the radar relay link. It was decided that controlling the fighters from the picture at Bempton would not work, so this was exercised solely from the Neptune, a first for the RAF. While it didn't go especially well, the view was that interceptions could be effected from the AEW aircraft, so long as the radar functioned properly.

Having limited resources, and spares, made this easier said than done. By now the maximum ranges being obtained by the radars in the Neptunes were about half what could have been expected "at peak efficiency". A concentrated period of checks and servicing on the two available aeroplanes culminated in a test flight on 20 December, and "excellent results" with both. It allowed No 1453 Flight to take up its trials work again on 24 January 1955, using Meteors of the Church Fenton wing on ground stand-by at Leconfield to intercept No 264 Squadron aeroplanes out of Linton-on-Ouse, using tracks originated by the Neptunes and the relayed display at Bempton as the control medium. The equipment worked well and several simulated kills were achieved. It was thought interceptions with fighters out of Leconfield "might well take place 20nm from the coast."

> ***"The spares situation caused a major servicing problem"***

After a week's interval, the focus was on using the Neptunes and the radar relay link to Bempton to control fighters on a patrol line within the AEW aircraft's cover. The verdict on this trial was that it had been "most successful", both the AEW and ground controllers proving more than able to effect successful interceptions on fast, low-flying targets "at considerable ranges from the coast". On 4 February, doing likewise with fighters patrolling with the Neptune amassed a more varied range of results, "but the feasibility of carrying out this type of interception had been adequately demonstrated."

This was all very much a case of concept-proving, instead of generating an actual operational capability. No 1453 Flight's Neptunes would probably have had a far harder time outside these structured trial scenarios, with targets appearing — if all went to plan — as per prior arrangement. The learning process enabled concepts to be honed, and using the aircraft and the datalink to afford control as well as early warning was one such. Identifying as early as practical the fighters picked up on the AN/APS-20 was considered a great aid in prosecuting successful intercepts using fighters on ground stand-by, since they could be difficult to distinguish from other radar returns when heading from their base to the coast. The suggestion was put forward of fitting the Neptunes with AN/APX-13A identification friend or foe equipment.

That 4 February 1955 sortie was the trial's last. No 1453 Flight kept up its preparedness as best it could through continuation training, from 26 April including weekly practice with fighter targets. To cut down on transit times, these were performed closer to the shore, with the attendant disadvantages of "decreased early warning, the adverse effect of coastal turbulence and the cluttering of the radar by coastal shipping responses". In May it added the provision of extra instruction for Coastal Command signallers in the use of AN/APS-20, "particularly with regard to the vectoring of a Neptune strike aircraft against shipping targets". It found their proficiency with the radar to be well below the flight's own. Engine hour restrictions imposed from July curtailed airborne activities to the minimum, and WX501 was out of commission for some time awaiting a powerplant change, yet the unit did the best it could.

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The Neptune was described as "highly complex" and, due to its supply under MDAP, as having "a restricted spares supply situation". All of this presented "a major servicing problem". Having an average of just one serviceable aeroplane from three undeniably hampered No 1453 Flight, and the maritime Neptune squadrons were similarly afflicted. Those co-located at Topcliffe each reported having between two and five of their eight machines available at any one time. Flying hours on the AEW aircraft were regularly conserved in an effort to maintain serviceability for upcoming trials, with the inevitable knock-on effect regarding the amount of continuation training it was possible to give flight crews and radar operators.

Were the Neptune to be adopted as an operational AEW platform, assuming the need constantly to maintain a particular patrol line would require three missions per day of up to 10 hours each. Given serviceability rates during the trials, a unit establishment of eight aircraft was viewed as necessary to equip an AEW squadron. It never came to pass.

When the final trial report was issued in August 1955, its headline recommendation was that the principle of using AEW operationally be accepted, accompanied by the necessary patrols, to be conducted by "a force of Neptune aircraft on a restricted watch basis". Should sufficient Neptunes not be available, No 1453 Flight should, it said, "be given a development and/or training task" encompassing weekly AEW exercises.

But by then the decision had been taken to transfer the unit back to Coastal Command, effective from 15 August. Its primary purpose became the development of anti-E-boat tactics, though the aircraft were still to be made available to Fighter Command "from time to time" for "further study of the AEW technique", and used for other roles as required.

It didn't last long. Disbandment followed on 30 June 1956, presaging the withdrawal of the whole RAF Neptune fleet, which was completed the following March. No 1453 Flight never performed a proper operational AEW sortie, but this should not mask the contribution it made to role development, even in the face of equipment and resource inadequacies. As Wg Cdr 'Tiger' Shaw at Fighter Command HQ wrote to Sqn Ldr Charles Lofthouse, who had taken over from Brinsden as 1453's 'boss', "the information we obtained by your efforts in the operation of AEW aircraft, and your practical suggestions, have been of great help to us in our future planning. You are well aware that the cost of maintaining AEW aircraft on such a scale as to be an effective addition to our defences is prohibitive in peace, and it is for this reason only that the decision to cease AEW operations was taken."

Tracing the story onwards reveals a familiar tale — the navy replaced its Skyraiders with the Fairey Gannet AEW3 in 1960, transferring the radars and intending for this to be yet another stopgap, only for it to last 18 years. As the Gannets were retired, some of those same radars had, meanwhile, found their way into the RAF Shackletons. It took their belated retirement for Britain's AEW force finally to lose the element of temporary improvisation that had characterised it from the start.

An early-standard RAF Neptune — probably not an AEW example given the individual code 8 on the nose, though they were externally indistinguishable in terms of configuration from their maritime counterparts — bashes the Kinloss circuit. CROWN COPYRIGHT

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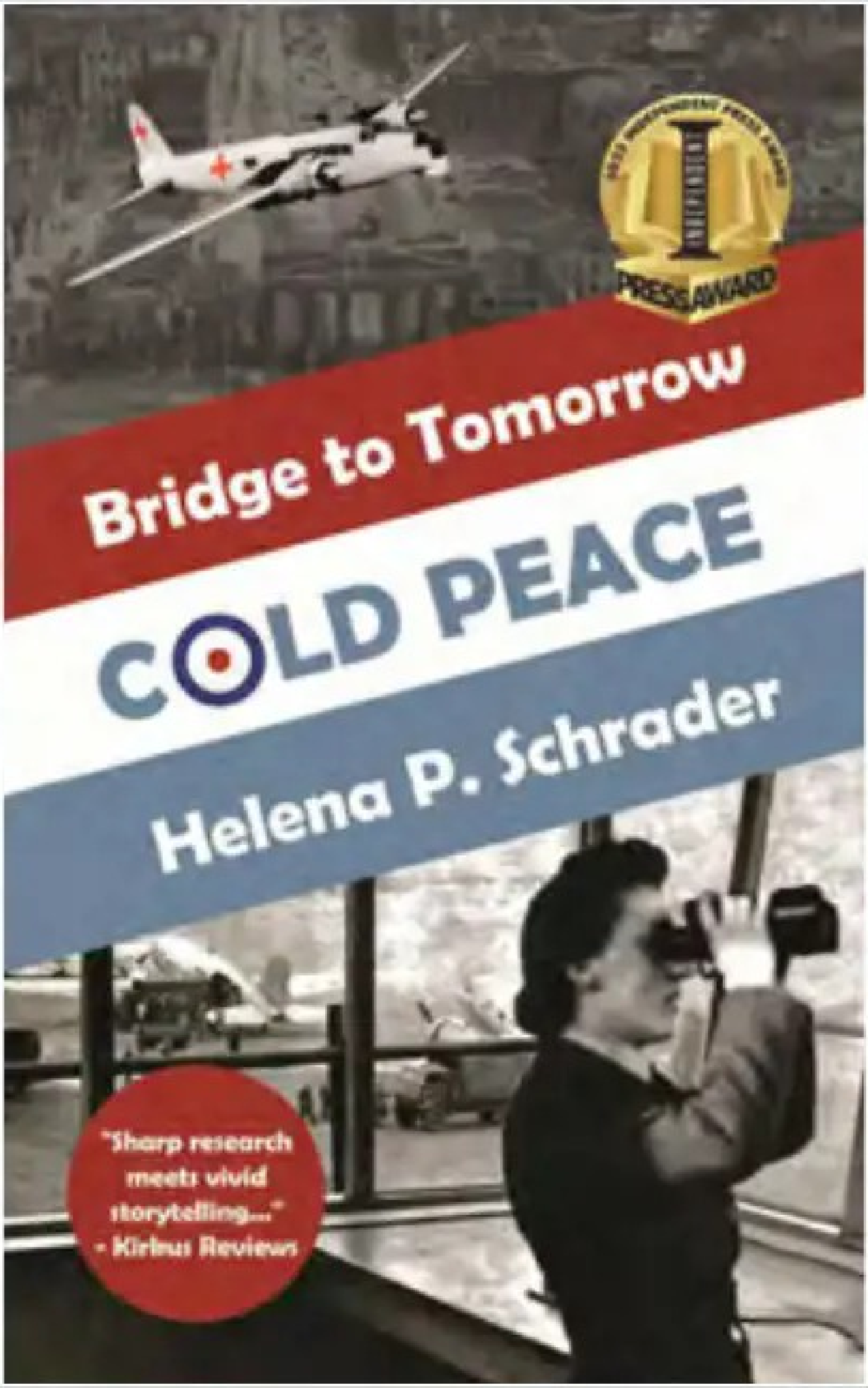
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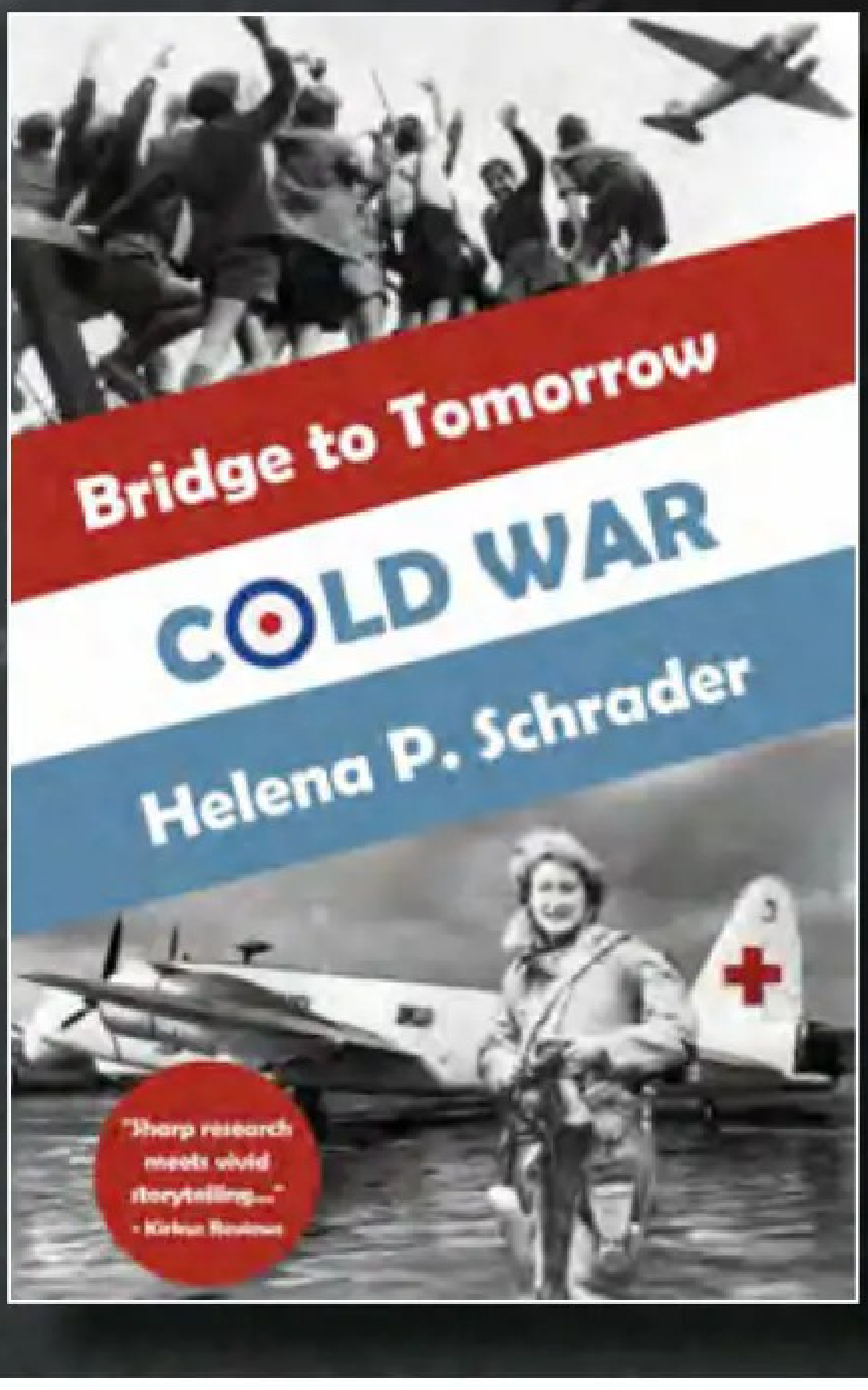
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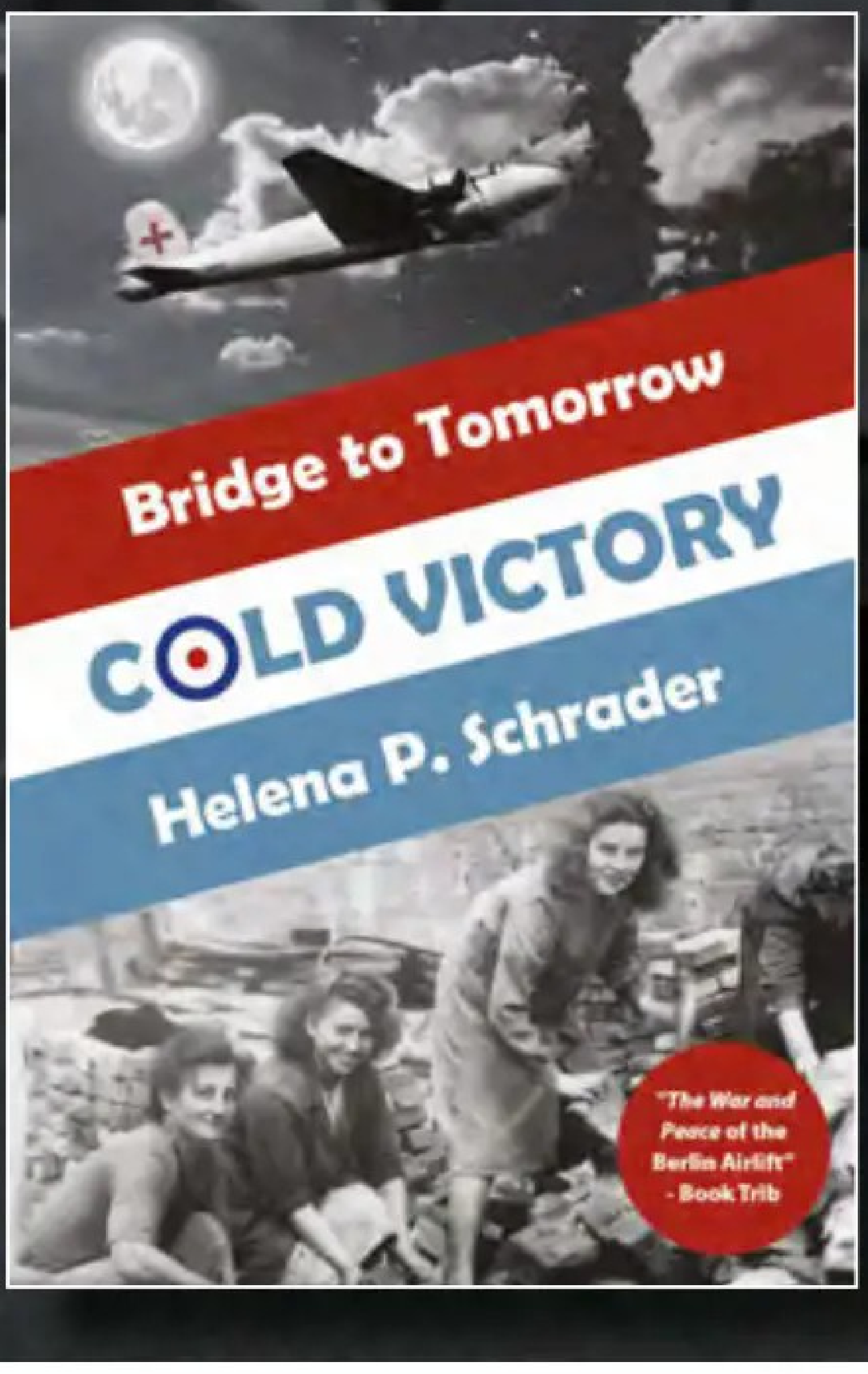
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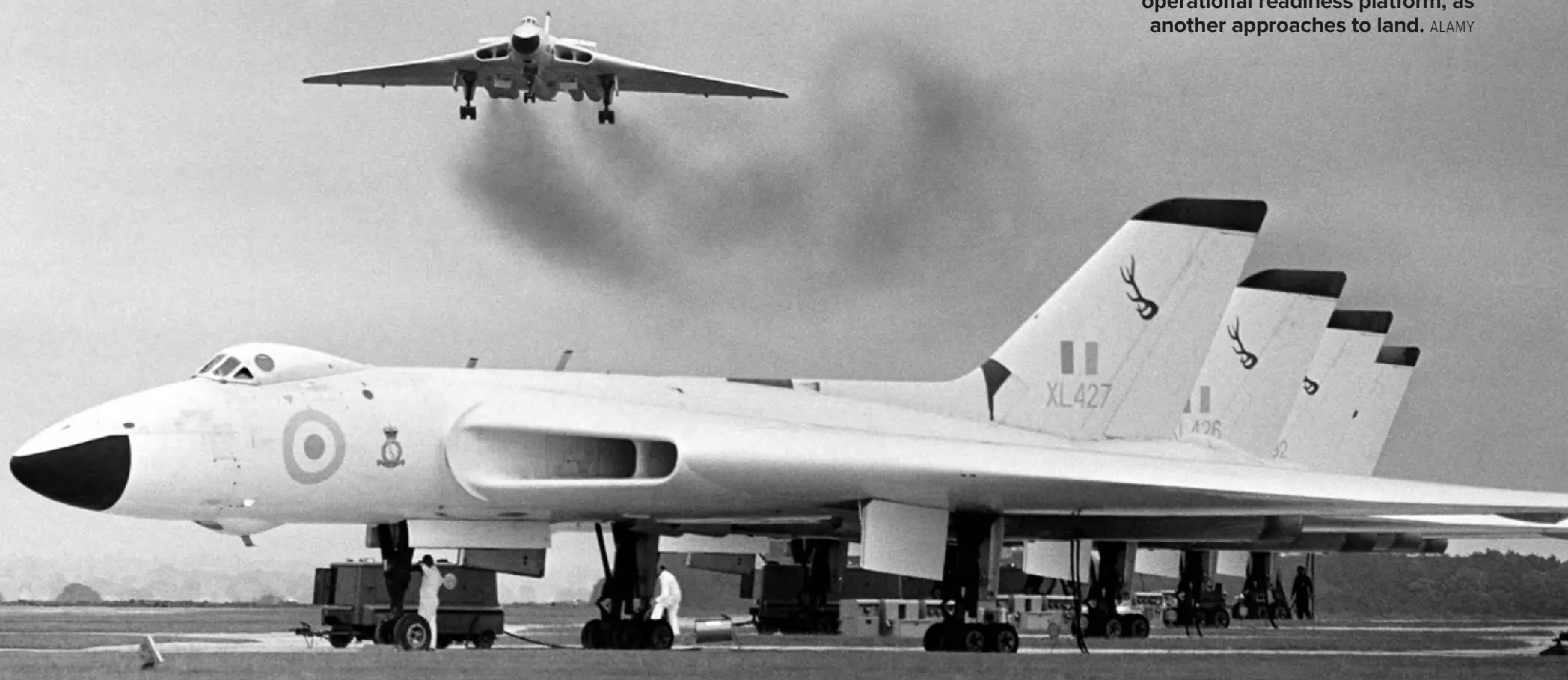
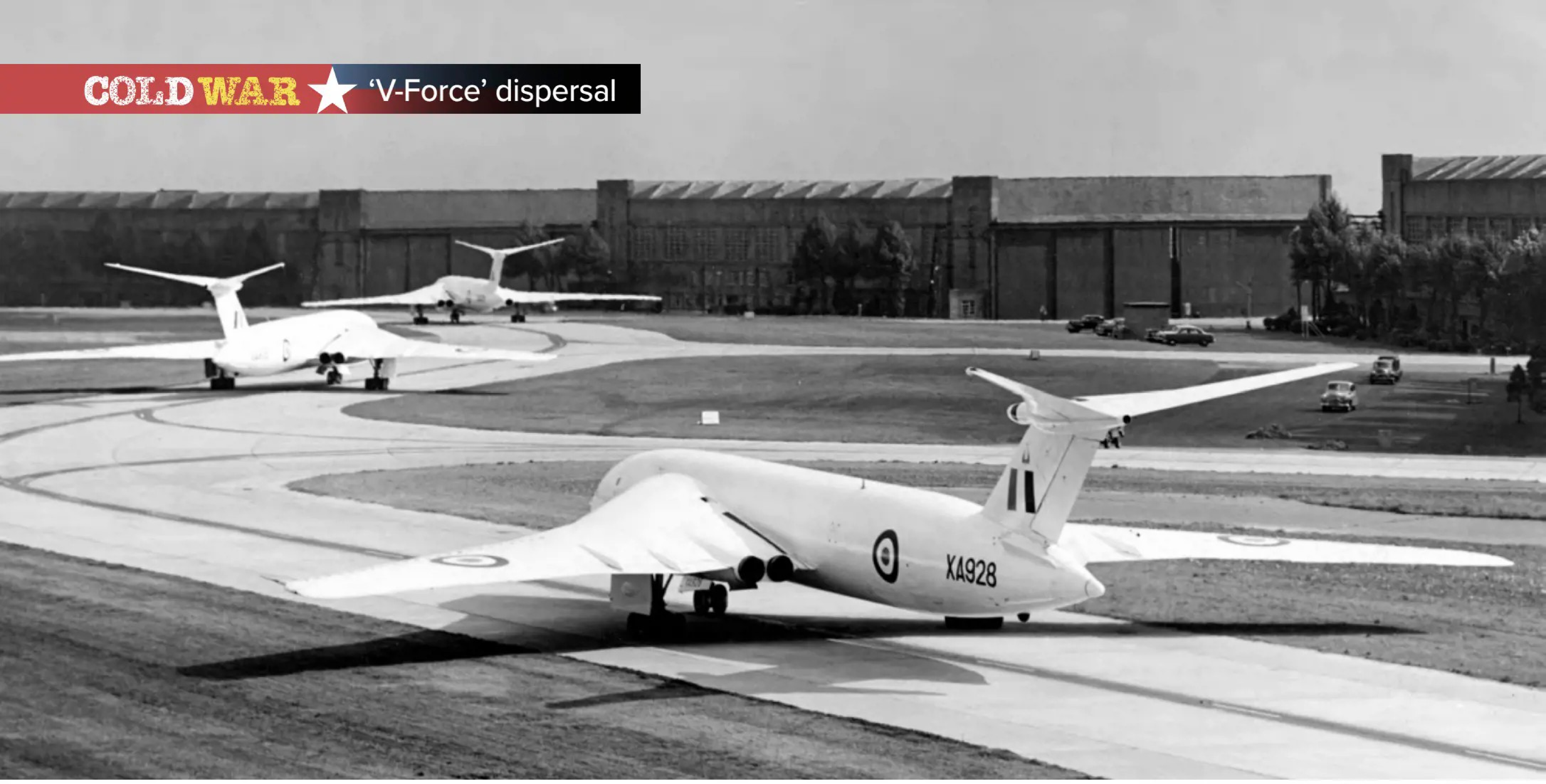
STATE OF ALERT

Across Britain, airfields stood ready to receive the 'V-bombers' in the event of impending nuclear attack. But although the dispersal concept was regularly exercised, even the Cuban missile crisis didn't trigger it

WORDS: BEN DUNNELL



At Wittering on 16 July 1963, Vulcan B2s of the Scampton-based No 83 Squadron occupy the four-aircraft operational readiness platform, as another approaches to land. ALAMY



ABOVE: Having aircraft snaking along conventional taxiways to the runway, as with these No 10 Squadron Victor B1s at Cottesmore in September 1958, would not generate the desired launch times. This was why the operational readiness platform came about. KEY COLLECTION

"In building a V Force armed with nuclear weapons we are endeavouring to establish a force in being, which a would-be aggressor, Russia in particular, must reckon with if she resorts to hostilities as a means to gain her ends.

"The V Force will pose a threat of retaliation of such consequence that it could negate the advantages of conquest, by destroying the aggressor industrially, administratively and economically before he could take advantage of his immediate gains.

"It is certain, therefore, that if Russia contemplates challenging the western nations to a trial of armed strength, she will seek ways of forestalling our retaliation from the outset. There is a strong probability that her first hostile act may be an attempt to destroy the V Force on its base by surprise. In organising the V Force we must take account of this in two ways.

"We must ensure that the Force can deliver its first, and strongest retaliatory blow within the time limits of warning we can rely upon.

"The force must be deployed in such a way that Russia will need to expend the largest possible number of her own nuclear weapons in order to be sure of destroying it, even if she achieves surprise. This will have the complementary effect of causing her to commit many nuclear weapons against our aircraft and airfields which might otherwise be directed against our centres of population and industrial complexes — a factor which will enhance the chances of survival of our nation and civilisation.

"Ten, accurately delivered, atomic bombs would suffice to destroy the V Force on the ground should it be found concentrated on the ten Class I airfields planned for Bomber Command. The enemy's force requirement rises in direct proportion to the amount by which the force on the ground is dispersed. Assuming that hydrogen bombs would damage aircraft on the ground over a radius of ten miles, we should endeavour to disperse the Force so that one bomb can destroy no more than one aircraft. If we could achieve this, Russia would need to mount an attack of such strength that it can ensure accurate delivery of 180 bombs against 180 separate targets in order to demolish the Plan L V Force of 1958, in addition to the force she might require to destroy Strategic Air Command's threat as well. Any reduction in this degree of dispersal is enhancing the enemy's chances of securing himself from damaging retaliation. If Russia attempts a surprise attack on our V Force bases, the amount of warning on which we can rely with absolute certainty may be very short, possibly under one hour. We would be well advised therefore to save every possible minute in our plans to get the force airborne once we see the attack coming. In this context, the fewer aircraft we have per airfield the less will be the time needed to get them into the air."

> **"The bases were central to the credibility of the deterrent"**

Stark words indeed. They were written by Air Marshal George Mills, Air Officer Commanding-in-Chief of RAF Bomber Command, in January 1955. He was outlining the top-secret plan to provide dispersal airfields for the coming fleet of 'V-bombers' — Vickers Valiant, Handley Page Victor and Avro Vulcan — in the event of war. These bases remained central to the credibility of Britain's deterrent for more than a decade.

The then current projections had the 'V-Force' building by 1958 to 240 aircraft, of which three-quarters "might be expected to operate on the first sortie in war". With "packets of not more than three aircraft", that meant a minimum of 60 airfields. Ten so-called Class I airfields would be the main bases. A preliminary examination of other aerodromes from which a 'V-bomber' with a war load "might be able to take off" gave 60 more without the need for additional work, of which 28 were felt to be immediately available to meet the needs during build-up of the force. The Chief of the Air Staff, Marshal of the Royal Air Force Sir William Dickson, "agreed to the principle".

The plan assumed several things, of which two stand out. Crews, it said, "will have been fully briefed in advance, and can act on their own initiative when ordered off". There was no need for anything other than up-to-date meteorological information when at dispersal. And the aircraft "will have been bombed up but not fully fuelled at the main base before dispersion". They would require communications to their "controlling formations" and the minimum of basic facilities, such as fuel and servicing. It sought, "in the main", existing active airfields to which the force could remain dispersed "for periods of at least seven days without any serious deterioration in serviceability, or crew training and morale."

A first airfield list was compiled in January 1955. Bomber Command's requirements were for a 6,000ft runway, located 10 miles or more from any Class I airfield, US Air Force atomic base or from London, and a LCN (load classification number) for the airfield pavement of not less than 20. Also, it did not select any airfield within 10 miles of another in the plan, though it did include some which were slightly below the criteria. As far as active airfields were concerned, it ended up with 24 in RAF and Royal Navy hands, four Ministry of Transport and Civil Aviation airfields, four under Ministry of Supply control, and four others which were separately earmarked for Plan 'Xenophon', the inter-service arrangements for the deployment of forces. Then there were four inactive RAF airfields that met all the criteria, six active RAF airfields with too low an LCN, and seven other active and 30 inactive airfields that were suitable but where the LCN had not been assessed.

By April 1955, there were two diverging plans. The Air Ministry envisaged 50 dispersal airfields and one four-aircraft flight staying at each of the 10 operational Class I airfields. Bomber Command — which also advocated the *permanent* dispersal of a quarter of the 'V-Force' — intended to disperse all its aircraft away from the Class Is except for the Valiants, one flight of which would remain at base, meaning it would need 57 dispersal airfields. Bomber Command opted for 10 geographical 'clutches' of airfields, each associated with a Class I parent. The Air Ministry had no 'clutches' and each dispersal relying on a Class I parent for servicing support.

LEFT: One solution to 'V-bomber' runway length requirements was to use jet-assisted take-off equipment, but although de Havilland Spectre rockets were tested at Hatfield on Victor B1 XA930 in 1960, the capability never came into service.
ALAMY

The Air Council approved a first phase involving eight Class I airfields — Coningsby, Cottesmore, Finningley, Honington, Marham, Scampton, Waddington and Wittering — and 34 dispersal airfields, costing £25 million for works services, installation of rocked-assisted take-off gear on aircraft, equipment, motor transport and communications, such as tele-scramble equipment to provide a direct link with Bomber Command headquarters at High Wycombe. However, a gap in the defence budget meant the cost of dispersal as now contemplated was, said the Chief of the Air Staff, "likely to be more than had been estimated or could be afforded."

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A December 1955 meeting chaired by Dickson discussed the possibilities. It agreed plans could be re-examined on the basis of mounting just one strike from dispersal airfields, and having the "serviceable element of one squadron" operating from the Class Is. The Vice-Chief of the Air Staff, Air Marshal Sir Ronald Ivelaw-Chapman, felt the "chances of getting off quickly" from those bases "with their superior facilities would be greater than from dispersal airfields", while stressing the need for the dispersal scheme, "to convince the enemy of the inevitability of a counter-strike". Having fewer dispersals would make it possible to select more suitable ones, dispersing aircraft more widely and making them less vulnerable. Bomber Command's AOC-in-C "doubted whether an effective attack involving a long and difficult flight to the target could be achieved by crews who had first sat at readiness at dispersal airfields for perhaps two weeks or for long hours in the cockpit."

In April 1956, wrote the Air Member for Supply and Organisation, ACM Sir Donald Hardman, "It is now high time to begin to translate our plans into action". The basis was eight Class I airfields and 19 dispersals within the first phase of build-up, providing for a 140-aircraft force during that period, with a related works bill of circa £3 million. Those dispersals comprised Aldergrove, Ballykelly, Boscombe Down, Cranwell, Filton, Gaydon, Kinloss, Leconfield, Leeming, Linton-on-Ouse, Lossiemouth, Lyneham, Pershore, St Mawgan, Tangmere, Tarrant Rushton, Thurleigh, Valley and Yeovilton.

The Air Ministry requirement was that dispersal airfields should be capable of receiving bombers at a maximum of four hours' notice, "at any time of the day or night". With non-RAF sites, it was agreed "that Bomber Command aircraft should be given absolute priority at their airfields in a period of emergency, under the threat of global war."

Inevitably there were changes. Ballykelly and Valley were felt unsuitable by Bomber Command; it was suggested in February 1958 to substitute Waterbeach and Duxford, both of which were earmarked for dispersal of half of Bomber Command's photo-reconnaissance Victor and Canberra force from Wyton. The list of Class I airfields was up to nine with the addition of Gaydon, and the concept of geographical dispersal had been abandoned. The 'V-Force' front line would now number 144 bombers — though this figure included the Valiants whose wartime taskings

ABOVE: It wasn't just the bomber force that required dispersal. So did the Wyton-based reconnaissance assets, exemplified by Victor B(PR)1 XA935 of the Radar Reconnaissance Flight, No 543 Squadron Valiant B(PR)1 WZ391 and a Canberra PR7 belonging to No 58 Squadron. ALAMY

were from 1960 in the hands of SACEUR, NATO's Supreme Allied Commander Europe — and 16 PR Victors, the latter dual-roled as bombers.

But the Soviet intermediate-range ballistic missile (IRBM) threat forced a reappraisal. Work on the existing dispersal scheme stopped in January 1960. In a report that June, the Air Ministry now expected at least 15 minutes' warning of a manned aircraft attack, but said the advent of America's BMEWS, the Ballistic Missile Early Warning System, would mean a minimum of three-and-a-half minutes' warning of attack by continental-based IRBMs. Bomber dispersal needed to take this into account, since the warning time "increases directly in proportion to the distance of the airfield from Fylingdales" — location of the UK element of BMEWS — "in a north-westerly direction". Thus, the best locations for airfields were "to the extreme north and west" of the UK, though it would not be possible to concentrate them all in those areas.

Eight Class I airfields and 12 others needed four-aircraft operational readiness platforms (ORPs) near their runway ends to further improve response times. Cutting taxi distances, it was subsequently calculated, would "appreciably increase the survival chances of the aircraft" in the event of an incoming atomic strike; for every aircraft length saved in taxiing, Air Ministry research said, "a mile will be added to the distance the aircraft can put between itself and the airfield before the first missiles arrive". Even though Bomber Command had an operational requirement to maintain five-minute in-cockpit and two-minute engines-running readiness states, evidence was growing that even these would in future be too slow.

At an Air Ministry meeting that July, it was suggested a stated need for just 20 dispersal airfields "would appear to weaken the argument" for the 'V-Force'. AVM Walter Pretty, the RAF's director general of organisation, expressed the view in a subsequent memo that the service was failing to match the build-up of its force with adequate dispersal facilities to achieve 15-minute readiness, "through lack of firm policy to date."

And change was coming to force composition. Britain planned to procure 140 Douglas AGM-48 Skybolt air-launched ballistic missiles, to be carried by aircraft mounting a continuous airborne alert. A standard Vulcan B2 could only take two Skybolts, so other options were sought, a version of the still-to-fly Vickers VC10 being the front-runner (see *Aeroplane* November 2021). The Air Ministry foresaw the force requiring dispersal consisting solely of 36 Skybolt-armed VC10s by mid-1968, rather than 144 medium bombers, and a gradual reduction of numbers in-between. But the VC10's airfield requirements were "more stringent" than those for the Vulcan, unless it could operate lightly fuelled — in which case, it might require tankers to be based at the dispersal airfields.

In any case, by January 1961 there were concerns regarding the Vulcan's airfield performance in B2S form at a high all-up weight with Skybolt — and especially given the propensity for Victor and Vulcan braking parachute failures. The command wanted runways of 7,500ft or more, and 12 airfields in the existing plan were shorter. As alternatives, it put forward Bruntingthorpe, Carnaby, Coltishall, East Kirkby, Elvington, Leuchars, Prestwick, Shepherds Grove, Stansted, Tibenham, Warton and Wattisham. Some of these may surprise, but remember, this was only just over a decade after the war's end and many runways survived at old bomber bases.

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To provide another shapshot, at the start of 1961 nine Class I airfields were in use plus dispersals at Bedford, Boscombe Down, Filton, Lossiemouth, Pershore, St Mawgan and Yeovilton. Aldergrove, Ballykelly, Bishops Court, Burtonwood, Dyce, Llanbedr, Machrihanish and Wick were to follow by the end of 1962. "Other dispersals" were available at Cranwell, Duxford (soon to close), Kinloss, Leconfield, Leeming, Lyneham, Manston, Middleton St George, Shawbury, Tarrant Rushton, Topcliffe and Valley.

Sir Thomas Pike was Chief of the Air Staff when, in June 1961, he accepted a proposal to reduce the number of available ORPs for the dispersal scheme from 120 to 100. Now, 14 airfields should be ready to accept four aircraft and 22 two aircraft. Finger-type, four-aircraft ORPs were planned at 24 of them. At the other 12, it was deemed possible for one or two bombers "to be positioned so as to be able to react within the required time". Having 36 airfields, said AVM John Grandy, Assistant Chief of the Air Staff (Operations) the previous September, meant the AOC-in-C could "'ring the changes' on his dispersal deployment very considerably and so keep the Russians guessing". While he acknowledged they would "eventually get to know which airfields are available and being exercised", a larger number of sites would make it "harder to pin-point the forces' whereabouts."

After many developmental problems, Skybolt was infamously cancelled during December 1961. The UK signed up to the Polaris nuclear-armed submarine programme instead, spelling an eventual end to the RAF's air-launched atomic deterrent. But the importance of the 'V-Force' remained paramount, as evidenced by the adoption from 1 February 1962 of a permanent quick reaction alert posture, whereby each squadron held an aircraft and crew at 15-minute readiness. From March onwards, the availability in quantity of British Yellow Sun Mk2 megaton bombs for the main force finally negated the problem of 'dual-key' arrangements for the previous American-supplied Project E weapons holding up or preventing dispersal with live stores. It was to prove timely, for there were flashpoints ahead.

> *The Soviet IRBM threat forced a reappraisal of the plans*

Come September 1962, the Air Ministry philosophy was now, "to enable the V-bomber force on ground alert to escape a pre-emptive Russian missile attack". While holding ground alert, it was expected the 'V-Force' would have between four and six minutes' warning from BMEWS and MIDAS, US Air Force Air Defense Command's satellite-based Missile Defense Alarm System, "in the worst case which assumes that the Russians will attack it with IRBMs on a low trajectory. The period of warning will vary slightly because bombers at Westerly dispersals will have about 2 minutes more warning than those at Easterly dispersals.

"Within the available period of warning of 1-6 minutes: (a) about half a minute will elapse between the receipt of warning and the order to scramble; (b) about another half minute will elapse before 'brakes off' for the first aircraft to commence its take off; (c) about

LEFT: Coming in over the fence at Filton, Vulcan B1A XH504 was among five aircraft from the Waddington wing which practised a dispersal to the Bristol factory airfield in the summer of 1962. PETER R. MARCH

'V-FORCE' DISPERSALS, MARCH 1962

Airfield	Command/Operator	Number of aircraft
Ballykelly	Coastal Command	4
Bedford	Ministry of Aviation	4
Boscombe Down	Ministry of Aviation	2
Brawdy	Royal Navy	2
Bruntingthorpe	US Air Force	2
Burtonwood	Bomber Command	4
Coltishall	Fighter Command	2
Coningsby	Bomber Command (Class I)	4
Cottesmore	Bomber Command (Class I)	4
Cranwell	Flying Training Command	2
Elvington	Air Ministry	2
Filton	Ministry of Aviation	2
Finningley	Bomber Command (Class I)	4
Gaydon	Bomber Command (Class I)	4
Honington	Bomber Command (Class I)	4
Kinloss	Coastal Command	4
Leconfield	Fighter Command	2
Leeming	Fighter Command	2
Leuchars	Fighter Command	2
Llanbedr	Ministry of Aviation	2
Lossiemouth	Royal Navy	2
Lyneham	Transport Command	2
Machrihanish	Royal Navy/SACLANT	2
Manston	Air Ministry	2
Middleton St George	Fighter Command	2
Pershore	Ministry of Aviation	2
Prestwick	Ministry of Aviation	2
St Mawgan	Coastal Command	4
Scampton	Bomber Command (Class I)	4
Stansted	Ministry of Aviation	2
Valley	Flying Training Command	2
Waddington	Bomber Command (Class I)	4
Wattisham	Fighter Command	2
Wittering	Bomber Command (Class I)	4
Wyton	Bomber Command (Class I)	4
Yeovilton	Royal Navy	2
Total		**100**

another quarter minute will elapse before each subsequent aircraft at a particular dispersal starts to move. Four dispersed aircraft will require in all about 2 minutes to become airborne. The remainder of the available warning period will be occupied in flying clear of the area of destruction resulting from attacks both on each airfield and on its immediate vicinity by a number of missiles.

"The fewer the number of dispersal airfields, (a) the greater the number of aircraft at each airfield and the longer the overall reaction time; (b) the greater the number of Russian missiles and the wider the area of destruction around each airfield. If the area of destruction is allowed to extend beyond a certain point it will be impossible for any bombers to fly clear in time, however rapid their reaction.

"36 dispersal airfields are the fewest which will afford a reasonable minimum of immunity to pre-emptive attack... The number has been dictated by considerations of economy and availability rather than military considerations."

Only the following month from that paper being issued, there occurred the Cuban missile crisis, when the world arguably came closest to nuclear war between the superpowers — and the Bomber Command dispersal concept could have been used 'in anger' had it been felt desirable. Soviet leader Nikita Khrushchev's deployment to Cuba of ballistic missiles capable of hitting American soil provoked a strong reaction from the US. As President John F. Kennedy implemented a blockade to stop further missile shipments, in London Prime Minister Harold Macmillan monitored events. If American demands to disarm the missiles, halt work on missile sites and cease deliveries were not met, how would Kennedy respond? And might Khrushchev make similarly aggressive moves on West Berlin? Macmillan decided to act, but not overtly.

'MAYFLIGHTS', 'MICKS' AND 'MICKY FINNS'

A line of No 101 Squadron Vulcan B1s detached to Middleton St George in 1960 is headed by XA909.
ADRIAN M. BALCH COLLECTION

To anyone living near the 'V-Force' dispersal airfields, or indeed any Soviet intelligence operatives looking on, it would have been obvious what was happening. Regular exercises tested the dispersal capability, not just in terms of the aircraft and their aircrews but also the personnel on the ground, whether from the main base or at the deployed location.

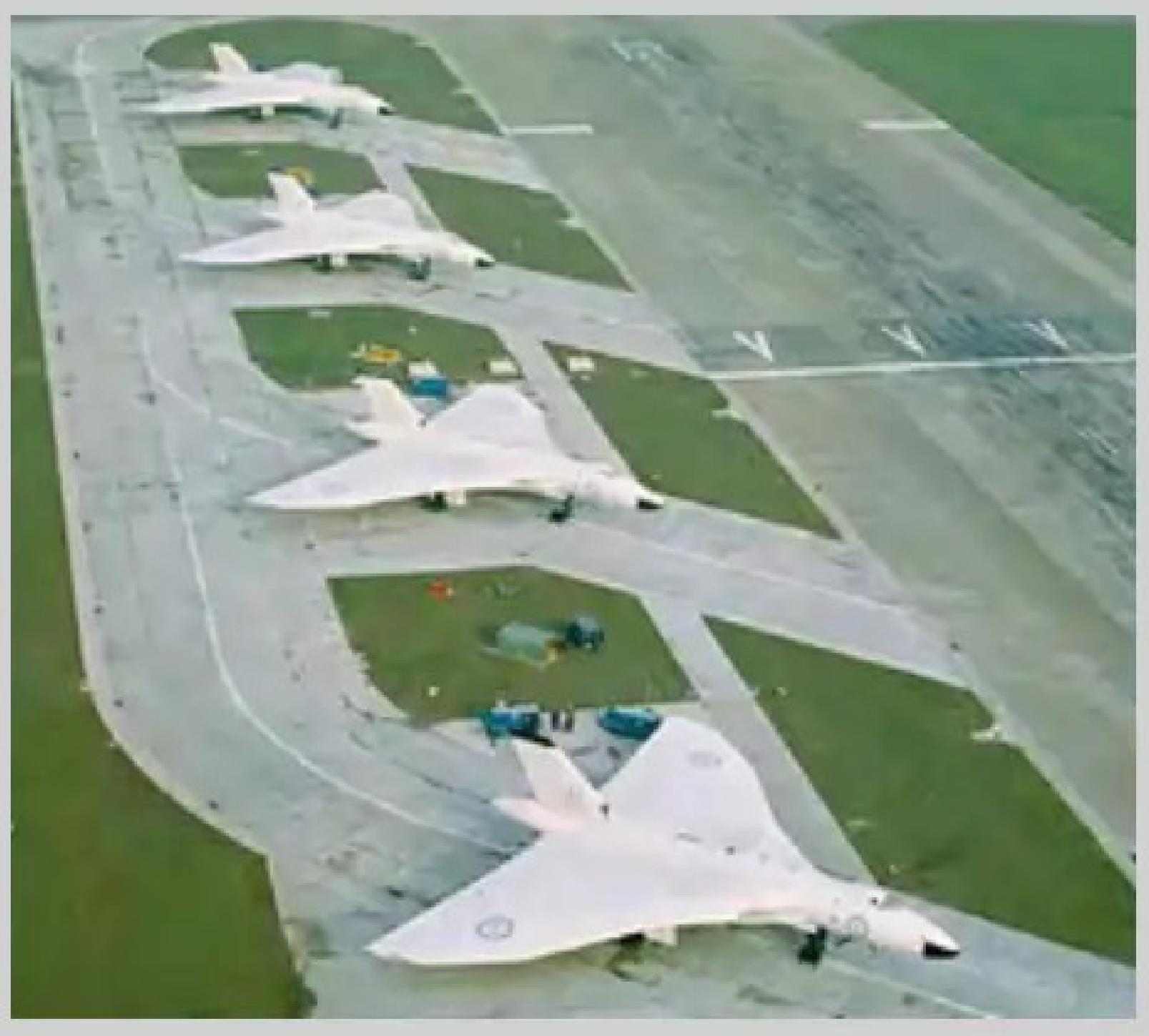
There was 'Mayflight', which encompassed bringing the force to alert, dispersing the bombers and scrambling them, but with prior notice. 'Mick' was the name given to testing the provisions involved in Alert Condition 3, described in one official document as, "certain precautionary measures short of the full and specific measures involved in the calling of higher Alert Conditions". 'Micky Finn' exercises were no-notice, whole-force affairs — or, in reality, as much of that force as could be generated — simulating "as far as possible the surprise conditions of a real emergency". They lasted 48 hours, and were not scheduled to take place more than once a year. Finally, squadrons undertook smaller-scale 'Kinsman' exercises with, generally, two or four aeroplanes. All allowed the regular evaluation of force readiness.

Geoffrey New was on No 27 Squadron at Scampton from 1966-70, flying Blue Steel-armed Vulcan B2s. "When an exercise was generated", he recalls, "all crews, both ground and aircrew, came to station readiness. Work being done in the hangars on aircraft was rapidly brought to a close, making the machine ready for flight. Ground equipment for each aircraft was assembled: David Brown tractors, air start units, ground power units, towbars, chocks, spares panniers and so forth."

This, for the detachments to the so-called distant or far dispersals, was where Transport Command — from 1968, Air Support Command — came in. A force of its aircraft was maintained at six hours' readiness for the purpose of supporting 'V-Force' dispersal. As of 1960 and the first operations order, this meant Hastings and Beverleys, but the types involved changed as the command re-equipped. "Beverleys, Argosies or Belfasts would arrive, load the heavy equipment and fly it off to the designated dispersal airfield", says New. "The serviceable Vulcans dispersed to the bases designated with an aircrew plus crew chief. Britannias fell into the mix, flying ground and aircrew to the appropriate dispersals with all their personal baggage and equipment for several days. As other Vulcans became serviceable they too dispersed.

"Once at the dispersal airfield the designed system kicked in for accommodation, messing, flight planning facilities, equipment storage, rapid ground transport to aircraft, medical availability, duty rotas, aircraft guards — normally an Alsatian dog with handler — and more. This was a massive logistical undertaking, an undertaking rehearsed many times which was fraught with issues unforeseen; normally, stupid oversights such as the tractor units running out of fuel. Errors that are human, errors that the planners at High Wycombe and Transport Command continually worked to eradicate. Each individual had his own specialist role, but to make things work smoothly a full understanding of the rest of the team's duties, responsibilities and sometimes difficulties had to be appreciated.

"On dispersal exercises, once established at the new temporary base the routine became an extension of QRA. While on duty in full flying gear by the aircraft, awaiting the signal from Bomber Command HQ, life passed by with much reading. Nowhere to go, nothing to do but wait. Once each person's specialist role had been completed, it became just a waiting game until the exercise was terminated. No dramatics, just small and very different teams working in unison to achieve one result. Great teamwork, great fun, even though the ultimate situation might be MAD [mutually assured destruction]."



The ORPs adjacent to Finningley's runway 21 illustrate how this arrangement afforded dispersed 'V-bombers' the ability to minimise taxi times and get airborne all the more quickly.
CROWN COPYRIGHT

LEFT: **No 207 Squadron's Valiants such as XD873 were the first to be operationally assigned to SACEUR, which meant they could not be tasked by Bomber Command — and thus not dispersed.**
TONY CLARKE

At 13.00hrs on Saturday 27 October the AOC-in-C Bomber Command, Air Marshal Sir Kenneth Cross, declared Alert Condition 3. This did not involve the generation of aircraft, but preparation for their "rapid generation if necessary". Key personnel stayed on station, operations room staff stood ready to be available.

At an RAF Historical Society seminar in 2001, AVM Michael Robinson, who had been CO of the Victor-equipped No 100 Squadron during 1962, recalled how on 27 October, "all available Victor aircraft and crews at RAF Wittering were brought to cockpit readiness 05 [five-minute readiness, fully crewed-up]. Each aircraft was loaded with one free-fall thermonuclear weapon, the crews had their 'go-bags' with all of the necessary route and target information and authorisation codes... we remained in our cockpits for several hours before being ordered to revert to readiness 15... It had been a long afternoon". This went for the entire force. Yet, famously, Macmillan did not order those 'V-bombers' that could be dispersed to do so.

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None of the increased readiness efforts attracted, so far as is known, any outside attention that autumn Saturday. At lunchtime the following day it became known the Soviets had climbed down; the immediate crisis was over. As future Chief of the Air Staff Sir Michael Beetham, then group captain operations at Bomber Command, said at a 2009 King's College London seminar, "It was all part of Macmillan's plan to play it down, play it quietly."

An interesting comment was made at the 2001 event by Sir Michael Quinlan, private secretary to Chief of the Air Staff Sir Thomas Pike in 1962. "[In] those days", he said, "ministers were far less apt to micro-manage affairs than they are today... The political guidance was 'Nothing overt, please' and the military were largely left to get on with it". It is not known whether Macmillan was specifically aware of the order given from Bomber Command's underground HQ in High Wycombe by Sir Kenneth Cross to move to readiness state 05. There is nothing in any of the former Prime Minister's diaries or memoirs to confirm he was, but such an escalation would have been for Cross to decide and remained consistent with the PM's stance. Dispersal would not have been.

Alert Condition 3 remained in force until 5 November, and there was a temporary increase in the numbers of Bomber Command QRA aircraft from six to 12. But the philosophy underpinning the dispersal plan and its regular rehearsal remained unaltered, though the list of airfields was revised. For instance, Coningsby was no longer a main base from late 1964, while Tarrant Rushton was

'V-FORCE' DISPERSAL PLAN, MID-1965

Main base	Aircraft	Dispersal
Waddington	4 Vulcan B1As	Bedford
	2 Vulcan B1As	Filton*
	2 Vulcan B1As	Machrihanish*
	2 Vulcan B1As	Brawdy*
	2 Vulcan B1As	Prestwick*
	2 Vulcan B1As	Valley*
	2 Vulcan B1As	St Mawgan*
Scampton	4 Vulcan B2s (BS)	Burtonwood*
	2 Vulcan B2s (BS)	Lossiemouth*
	2 Vulcan B2s (BS)	Elvington
	4 Vulcan B2s (BS)	Kinloss*
	4 Vulcan B2s (BS)	Coningsby
Cottesmore	2 Vulcan B2s	Yeovilton*
	2 Vulcan B2s	Llanbedr*
	2 Vulcan B2s	Lyneham*
	4 Vulcan B2s	Ballykelly*
	2 Vulcan B2s	Leuchars*
	2 Vulcan B2s	Pershore*
	4 Vulcan B2s	Finningley*
Honington	2 Victor B1As	Boscombe Down*
Wittering	4 Victor B2s (BS)	Wyton
	2 Victor B2s (BS)	Bruntingthorpe
	4 Victor B2s (BS)	Gaydon
Marham	2 Valiants	Cranwell
	2 Valiants	Coltishall
	2 Valiants	Manston*
	2 Valiants	Wattisham
	2 Valiants	Leconfield*
	2 Valiants	Middleton St George*
	2 Valiants	Leeming
Total	**76**	

Key: *BS — Blue Steel-equipped aircraft; * — distant dispersals, requiring air transport support to deploy from main base (all others are near dispersals, for which road transport sufficed)*

Note: *This list was drawn up before the grounding of the whole Valiant fleet in late January 1965.*

relinquished by the Air Ministry. Reallocations were necessary with 1963's arrival of the Avro Blue Steel stand-off nuclear missile, as a Victor B2 so armed needed 9,000ft for landing in case of brake 'chute failure.

And it made "no military sense at all" to keep all the 24 Marham-based, SACEUR-tasked Valiants at one location. Bomber Command advocated using some of the 36 dispersal bases for them too, this having been prohibited by their use of US Project E weapons, though the type's withdrawal due to fatigue issues put paid to such ideas.

As the Soviet threat evolved, Bomber Command's overall strength was on a downward trajectory. By April 1965, its HQ was saying, "in the light of the current and future missile threat, the degree of immunity offered by dispersal, per se, is reducing, and that the difficulties inherent in manning, equipping and operating 32 dispersal airfields from only four main bases would be very great, particularly for the two Blue Steel stations". Still the command needed 88 ORP positions for what it termed the "long-term front line" of 88 aircraft, now minus the Valiant, "on the assumption that circumstances would permit the generation of weapon systems over a period of some days" — a subject that had long been the cause of discussion — "but from fewer total airfields than are presently available". It suggested four main bases, namely Waddington, Wittering, Cottesmore and Scampton, and 26 dispersal airfields, not 36.

From the start of 1966 it ended up with 84 ORP positions, which still met the operational requirement, and 29 dispersal airfields. No longer would bombers disperse to Bruntingthorpe and Burtonwood, neither of which was required by the RAF after their transfer from the USAF; Cranwell, its runway being too short; Elvington, inactive other than as a relief landing ground; Llanbedr, which had "a difficult radar approach and problems caused by a sheep grazing contract" (seriously); Middleton St George, now in civilian hands as Tees-Side Airport; or Prestwick, which was too busy with civil traffic.

Even after the 'V-Force' lost its strategic nuclear deterrent role during 1969 to the Royal Navy and Polaris — and its QRA commitment ended — what was now RAF Strike Command still retained and exercised the dispersal concept, but on a smaller basis, and from gradually fewer airfields as units disbanded and aircraft were redeployed. It had always been a key component of British military planning, but as the last WE177B tactical nuclear weapon-armed Vulcans bowed out of the strike role, the need for this contingency passed.

How would it have worked in practice, had the balloon gone up? No-one can answer that. Exercises are one thing, scaling up to a 'hot war' another. But Sir Michael Beetham spoke for many in 2009 when he said, "[The] one thing that we did not want to have was part of the force or the whole force knocked out on the ground. We had to be ready to go when the alert stage called. It was a very responsible job and the crew was very conscious of its responsibility". That, above all, would have been the best guarantor of success.

On 13 November 1962, just weeks after the Cuban missile crisis brought the 'V-Force' to five-minute cockpit readiness, a trio of Scampton-based Vulcan B1s fly in formation. ALAMY

A dramatic angle on Vulcan B1A XH479 as it makes an approach to Filton at the start of an August 1962 detachment. PETER R. MARCH

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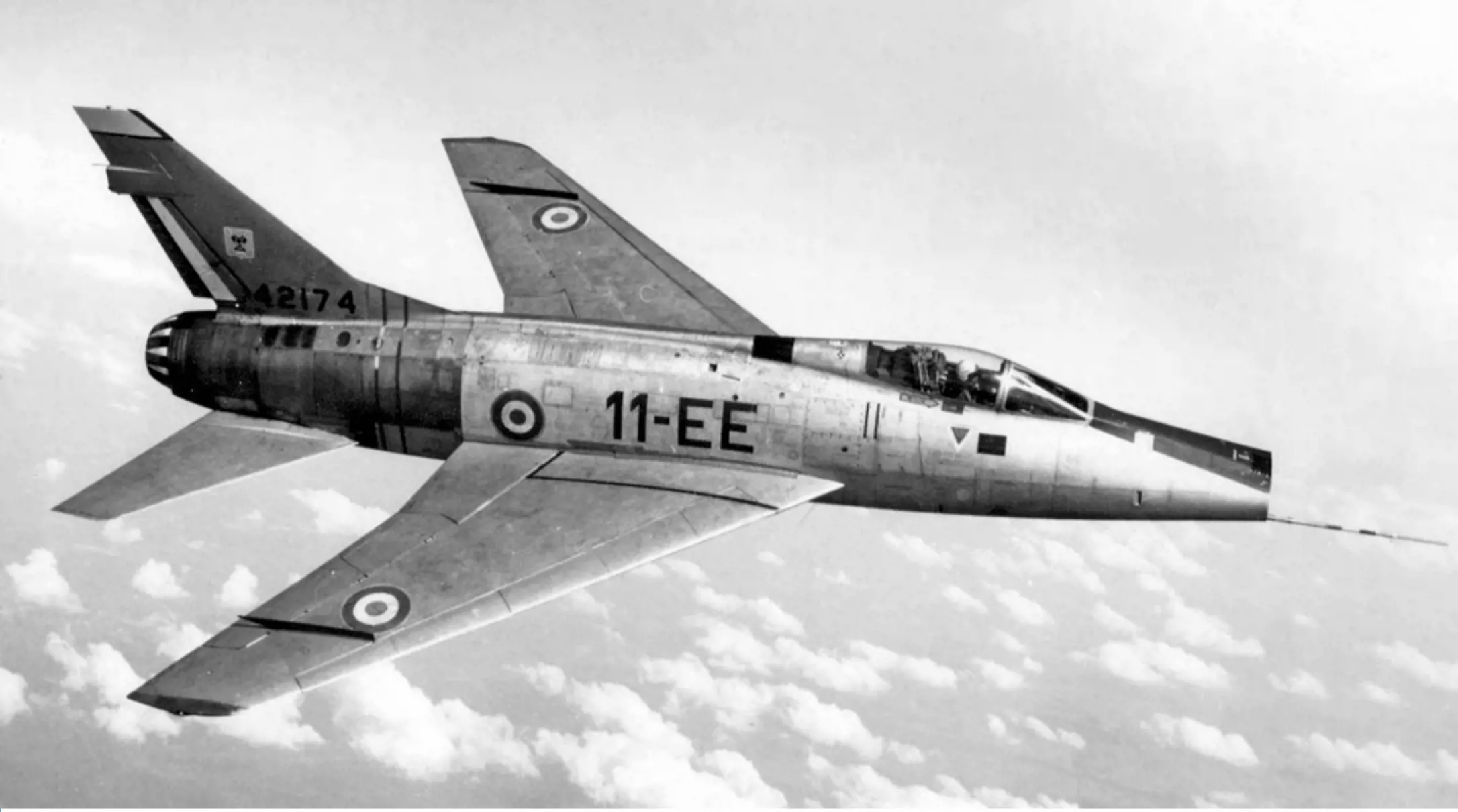
SABRE TEETH

As an Armée de l'Air fighter pilot fresh out of training, being posted to fly the North American F-100 Super Sabre was an exciting, if daunting, prospect. One of those fortunate to become a 'Hun' driver relates the type's French service, and his experiences of this "enormous beast"

WORDS: PIERRE-ALAIN ANTOINE

Wearing the later camouflage scheme, these F-100Ds hail from Escadron de Chasse 2/11 'Vosges'.
JEAN-LOUIS GAYNECOETCHE COLLECTION



ABOVE: **Cne Denis Letty flying F-100D 54-2174 in service with EC 1/11 'Roussillon' around the time the parent wing left Germany for Toul. This aircraft is nowadays preserved in the Midland Air Museum at Coventry.** CLAUDE PIET COLLECTION

It was often said there were two types of fighter pilot in the French Air Force: those who flew the F-100, and those who regretted all their lives not being among the cadre who took the controls of this monster. When I saw one at an airshow at Luxeuil in 1959, there I said to myself that one day I would be a Super Sabre pilot. I was not to be disappointed.

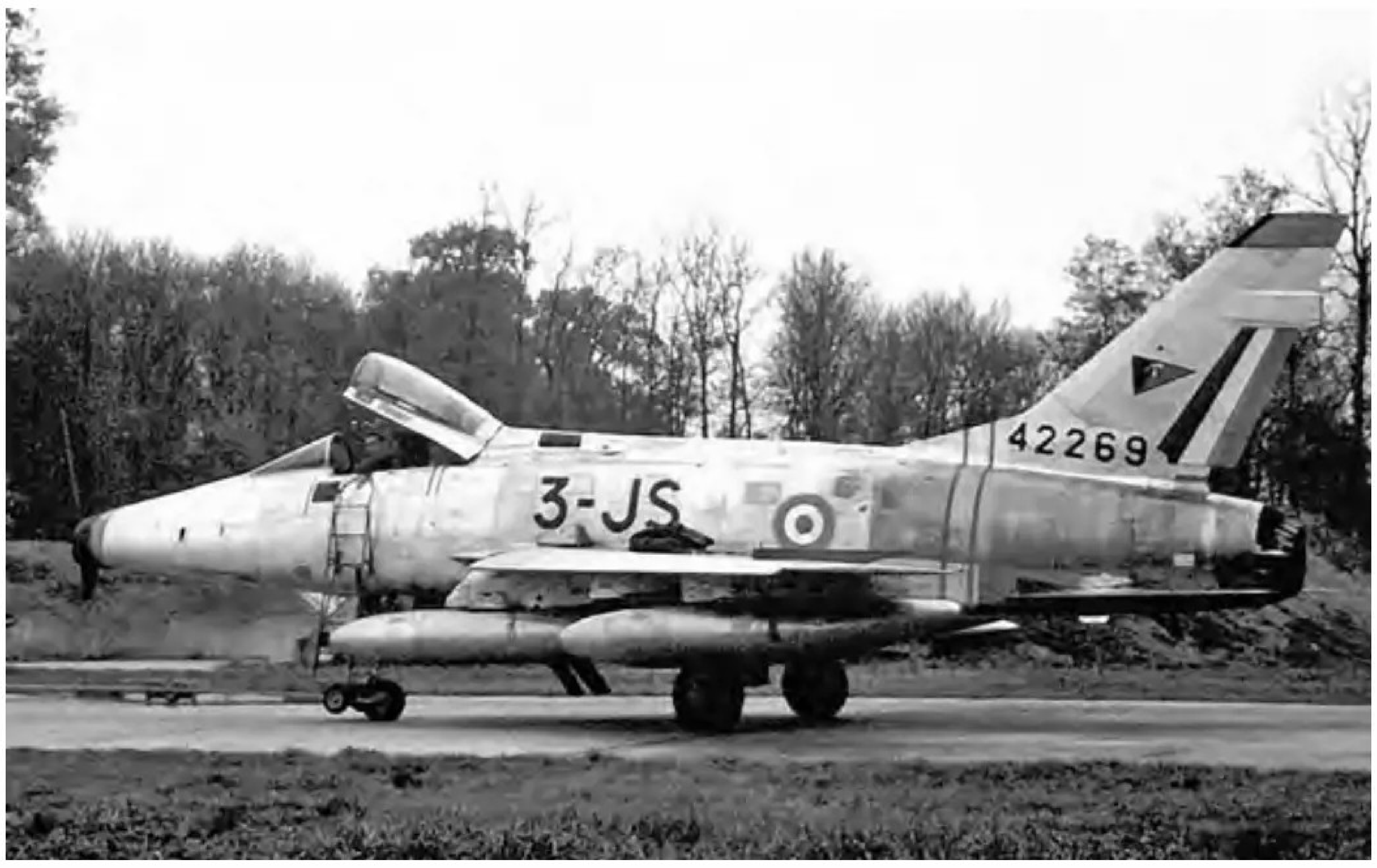
As the initial foreign user of the Super Sabre, France received 88 F-100Ds and 14 F-100Fs, including 13 F-100Ds which were bought directly by the French government. The maiden delivery took place at Luxeuil-Saint-Sauveur air base during the winter of 1958. By contrast, the last Armée de l'Air F-100 flight was made in December 1978 — an army co-operation sortie in the French protectorate of Djibouti on the Horn of Africa.

The 11ème Escadre de Chasse, formerly a Republic F-84G/F unit, received its 'Huns' before any other Armée de l'Air wing. Some of them were early ex-US Air Force aircraft, which had already been based in France with the 48th Tactical Fighter Wing. They came to the 11ème Escadre via an inspection and repair as necessary process at Getafe in Spain, and the first F-100Fs for squadrons Escadron de Chasse 1/11 'Roussillon' and EC 2/11 'Vosges' still wore USAF 'buzz numbers' on the fuselage, starting with FW.

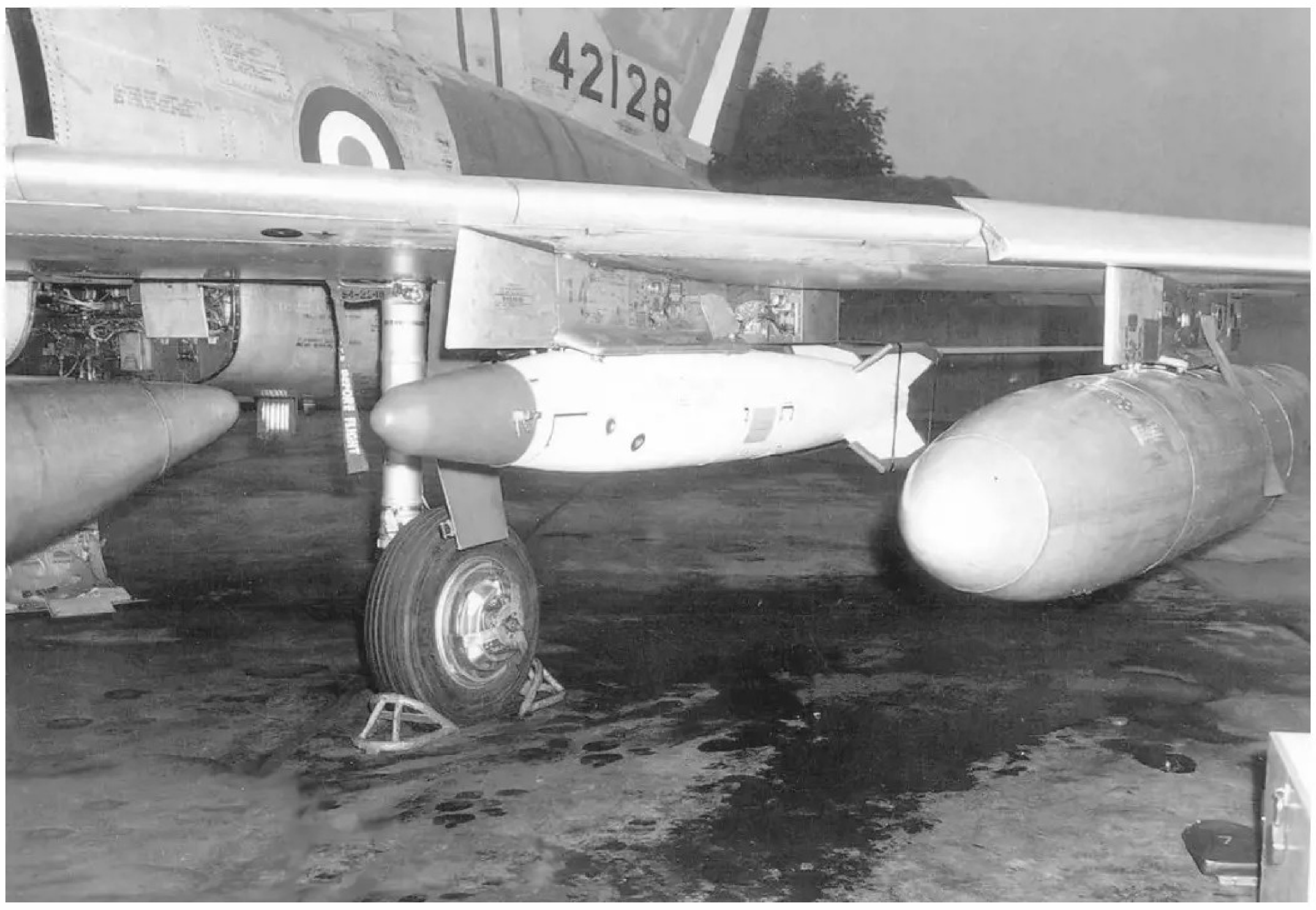
A group of pilots went to Luke AFB, Arizona at the beginning of January 1958 for F-100 indoctrination, returning in May. They were mightily impressed by the type with its afterburning engine, capacious cockpit and outstanding interception capability. It was the first time the Armée de l'Air had operated an aeroplane capable of supersonic speeds in level flight. Conversion of the wing at Base Aérienne 116 Luxeuil-Saint-Sauveur took 18 months and was completed by the end of 1959.

Next to transition was the 3ème Escadre de Chasse which, like the 11ème, had deployed F-84Fs to RAF Akrotiri during the Suez crisis. Its Super Sabres began arriving at BA112 Reims-Champagne in January 1959 to re-equip EC 1/3 'Navarre' and then EC 2/3 'Champagne' with 24 aircraft in each squadron. They were delivered by USAF ferry pilots and refuelled en route by KC-97 tankers. The switch was concluded by the end of January 1960, but EC 1/3 had already been in action from late 1959 in the Algerian campaign, flying ground attack sorties against targets in eastern Algeria from Reims and refuelling at Istres on the return leg.

The newly equipped squadrons deployed to the live gunnery training unit at Cazaux, south-west of Bordeaux, for armament practice with 11 aircraft from EC 2/3 and 13 from 1/11. In a total of 937 sorties they gained proficiency in air-to-air and air-to-ground gunnery, napalm, rocket and Mk25 bomb delivery.



LEFT: **Four jettisonable fuel canisters of 200 US gallons each are mounted under the wings of EC 2/3 'Champagne' F-100D 54-2269.** VIA PIERRE-ALAIN ANTOINE



RIGHT: A BDU-20/C practice bomb, used for B57 nuclear weapon training, fitted to F-100D 54-2128 of EC 2/3. This training store was nicknamed 'Dr Pepper'. VIA PIERRE-ALAIN ANTOINE

The 3ème Escadre moved to BA139 Lahr in West Germany on 10 June 1961, while the 11ème Escadre transferred to BA136 Bremgarten at the same time. This coincided with the assumption of nuclear strike status, using Mk28 RE atomic weapons as part of NATO's 4th Allied Tactical Air Force. The stores and fuel tank fits were identical to those of their USAF Victor Alert counterparts except French pilots never flew with the actual nuclear weapons, missions with training 'shapes' being the principal activity.

> *"The QRA aircraft were guarded by US and French sentries"*

Mostly, the F-100s employed simulated nuclear stores on low-altitude bombing system (LABS), low-altitude drogue delivery (LADD) or skip-bombing sorties over the Bodensee range at what we called TBA, for très basse altitude — very low altitude — or at the Suippes range south of Reims.

EC 2/11 was the first to achieve readiness in the strike role on 20 May 1963 and established a two-aircraft quick reaction alert, the aircraft guarded by a mix of American and French sentries. The German-based French squadrons thus became fully integrated into NATO's nuclear strategy without having to upload US nuclear weapons on French soil.

After 1967, EC 3/11's 'Huns' were fitted with in-flight refuelling probes — the cranked or 'swan neck' variant — to practise refuelling from C-135F tankers with hose-and-drogue extensions to their flying boom systems. Armée de l'Air F-100s took part in AFCENT Tactical Air Meets, flying strike, close air support and low-level navigation sorties in 1963 at Rheine-Hopsten and in 1964 at Chaumont.

When Gen de Gaulle took France out of NATO's integrated military organisation — it never actually left the alliance — the F-100s were redeployed away from Lahr and Bremgarten, while USAF and Royal Canadian Air Force units were obliged to depart their French bases. For the 3ème Escadre, that meant relocating to BA133 Nancy-Ochey in September 1967 after transitioning at Lahr to the Mirage IIIE. After a brief extension of its stay at Bremgarten, the 11ème moved to BA136 Toul-Rosières, an American-built base in eastern France, about 20km west of Nancy in the Lorraine region, between July and September. Twenty F-100Ds and four F-100Fs from the 3ème

RIGHT: A reasonably low-level training sortie by EC 1/11 F-100D 54-2187. JEAN-LOUIS GAYNECOETCHE COLLECTION

LEFT:
Their Pratt & Whitney J57-P-21 engines in afterburner — which on the Super Sabre meant full afterburner — F-100Ds 54-2203 and 54-2204 take off from Toul in 1970.
CYRIL AVINENS COLLECTION

Escadre were absorbed to form a new squadron, EC 3/11 'Corse', firstly at BA132 Colmar-Meyenheim and then at Toul. There was also a change of role, as the F-100s became part of France's FATac (Force Aérienne Tactique) with a conventional mission involving close air support and ground attack. Their secondary air defence task included protection of the Berlin air corridors.

❖

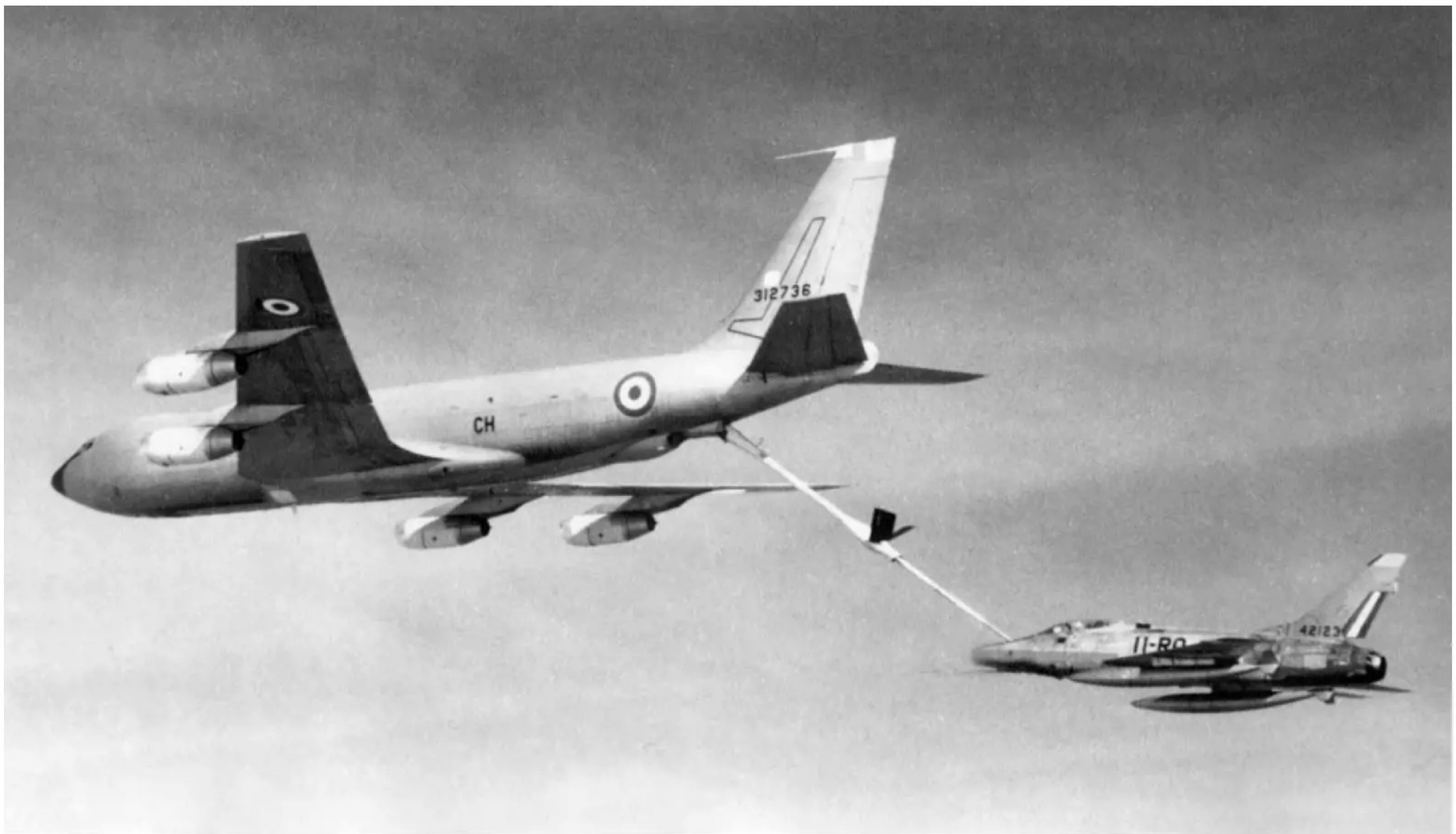
EC 3/11 became the F-100 operational conversion unit, and later in 1967 it included as part of its syllabus training for in-flight refuelling and for overseas interventions, such as air policing missions in Djibouti from April 1970. Prior to that it had flown successful simulated anti-shipping strikes against the carrier USS *Saratoga* with eight aircraft in December 1969, during the 'Lafayette' exercises in Mediterranean airspace, and achieved excellent scores in the AFCENT Gunnery Competition. Three of 3/11's aircraft took part during November 1971 in a three-month evaluation of the type's resistance to the difficult climatic conditions experienced in Djibouti, bordering the Gulf of Aden.

North American Aviation proposed a structural reinforcement programme for 30 of the wing's older F-100Ds in 1973, comprising strengthening of the wing box and skins, and the main fuselage longerons. The work was carried out at the SNIAS (Société Nationale Industrielle Aérospatiale) facility at Châteauroux, continuing into 1975. Concurrently, a three-tone USAF-style camouflage scheme using lighter shades of tan and green with blue-grey undersides was applied to the fleet between 1972 and 1976. The base at Toul received its first camouflaged 'Hun', serial 54-2160/11-ET, on 23 June 1974.

When EC 4/11 'Jura' was formed at BA188 Djibouti on 1 June 1973, it drew its pilots and two aircraft from each of the other units, with an extra pair of F-100Ds and an

LEFT:
The USAF base at Spangdahlem, West Germany, welcomed a deployment of EC 2/11 jets in June 1970 including F-100D 54-2196.
ADRIAN M. BALCH COLLECTION

RIGHT: The entry into Armée de l'Air service of the C-135F in 1964 provided a very capable air-to-air refuelling asset with which to support the Super Sabres. JEAN-LOUIS GAYNECOETCHE COLLECTION



F-100F being provided by EC 3/11. It took over the name and insignia which had previously been used by EC 3/11 'Jura' and a mission involving air defence and escort for reconnaissance flights that had begun in December 1972.

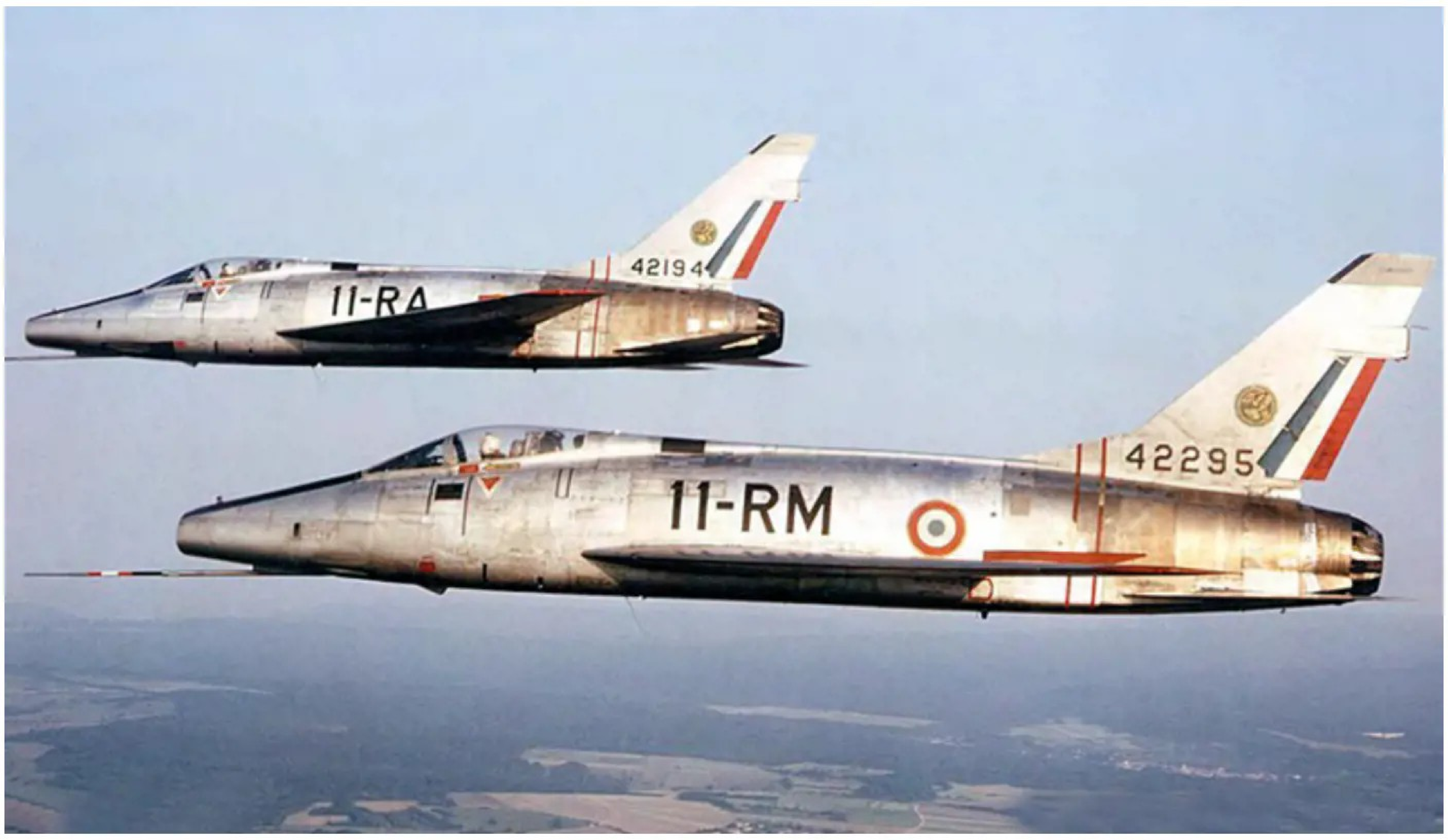
Conversion of EC 3/11 to the SEPECAT Jaguar got under way in February 1975, having accumulated 36,704 flying hours on F-100s. EC 1/11 also moved to the Anglo-French strike jet after making its final Super Sabre flight on 10 October 1975. EC 2/11 kept the 'Hun' until 25 June 1977, when it too became a Jaguar operator. The 11ème Escadre had put a total of 200,000 F-100 hours in the books. Col Boichot, Toul's base commander and one of the original cadre of French pilots to convert to the type at Nellis AFB, made the last F-100 flight from the airfield in 54-2131/11-MJ on 11 May 1977.

❖

EC 4/11 continued with the remaining 'Huns' in Djibouti, replacing EC 1/21 and its AD-4N Skyraiders there in January 1973. Missions from BA188 shared a runway with the republic's airport and sought to protect the fledgling state from incursions by communist-inspired insurgents. The squadron's initial strength of seven F-100Ds and an F-100F for one flight, SPA 158, was soon increased to 15 aircraft and a second flight, SPA 161, added. Between March and June 1978 the aeroplanes acquired some of the most spectacular shark-mouth markings ever seen and one or two recce pods on the inner wing position were decorated with eagles' heads based on the decor of the 498th Bomb Squadron's B-25J Mitchells in World War Two. That May, Lt Col Salmon led 11 F-100s in formation over Djibouti to celebrate the squadron's 10,000 hours of Super Sabre flying. Its final flight was made on 12 December 1978 and EC 4/11 was deactivated at the end of that year, concluding more than 20 years of F-100 operation by the Armée de l'Air.

Under the terms of the Military Assistance Program, the 40 surviving F-100s were returned to USAF charge at RAF Sculthorpe, Norfolk, where they were scrapped or donated to museums. Others stayed as decoys at Djibouti. One aircraft, 54-2165/11-ML from EC 2/11, had previously served with the USAF's 493rd Tactical Fighter Squadron, 48th TFW at Chaumont-Semoutiers from 1957-59 before passing to EC 1/3 at Reims as 3-IG. After nearly two years of storage at Sculthorpe it was donated to the Imperial War Museum at Duxford and was later exhibited in the American Air Museum, marked as a Vietnam War aircraft of the 352nd TFS, 35th TFW. During 2016 it was returned to the US.

BELOW: A very fine pair of EC 3/11 aircraft, F-100D 54-2194 leading 54-2295. JEAN-LOUIS GAYNECOETCHE COLLECTION



But how did I come to achieve my F-100 dream? After flying training, I received my wings on 10 June 1970 with the Ecole de Chasse at BA705 Tours. My class of 15 new fighter pilots was then sent to BA120 Cazaux, near Arcachon, for an operational training period with the 8ème Escadre de Chasse equipped with Mystère IVAs. The four-month course mainly involved aerial combat, low-level navigation and air-to-ground work — with cannon, rockets and practice bombs — as well as our first air-to-air cannon firings. It concluded at the end of October 1970.

When the Armée de l'Air's inspector of fighter aviation revealed the places available on the different types in air force service, the aim was to be transferred either to the Mystère IVA, which was still flown by the 7ème Escadre de Chasse at BA133 Nancy-Ochey, to the Super Mystère B2 at BA110 Creil with the 10ème Escadre de Chasse or the 12ème Escadre at BA103 Cambrai, or the Super Sabre at BA136 Toul-Rosières. All 15 of us really wanted an F-100 posting, but there were just five positions available.

As I didn't fare too badly in the final tests, I joined the 11ème Escadre, arriving there at the beginning of November 1970 with my four colleagues. We were immediately put through our paces by instructors who knew by heart this enormous beast with a 39,000lb maximum take-off weight, powered by a Pratt & Whitney J57-P-21 turbojet engine.

> ***"Before flying the two-seater we had to pass the 'blindfold' test"***

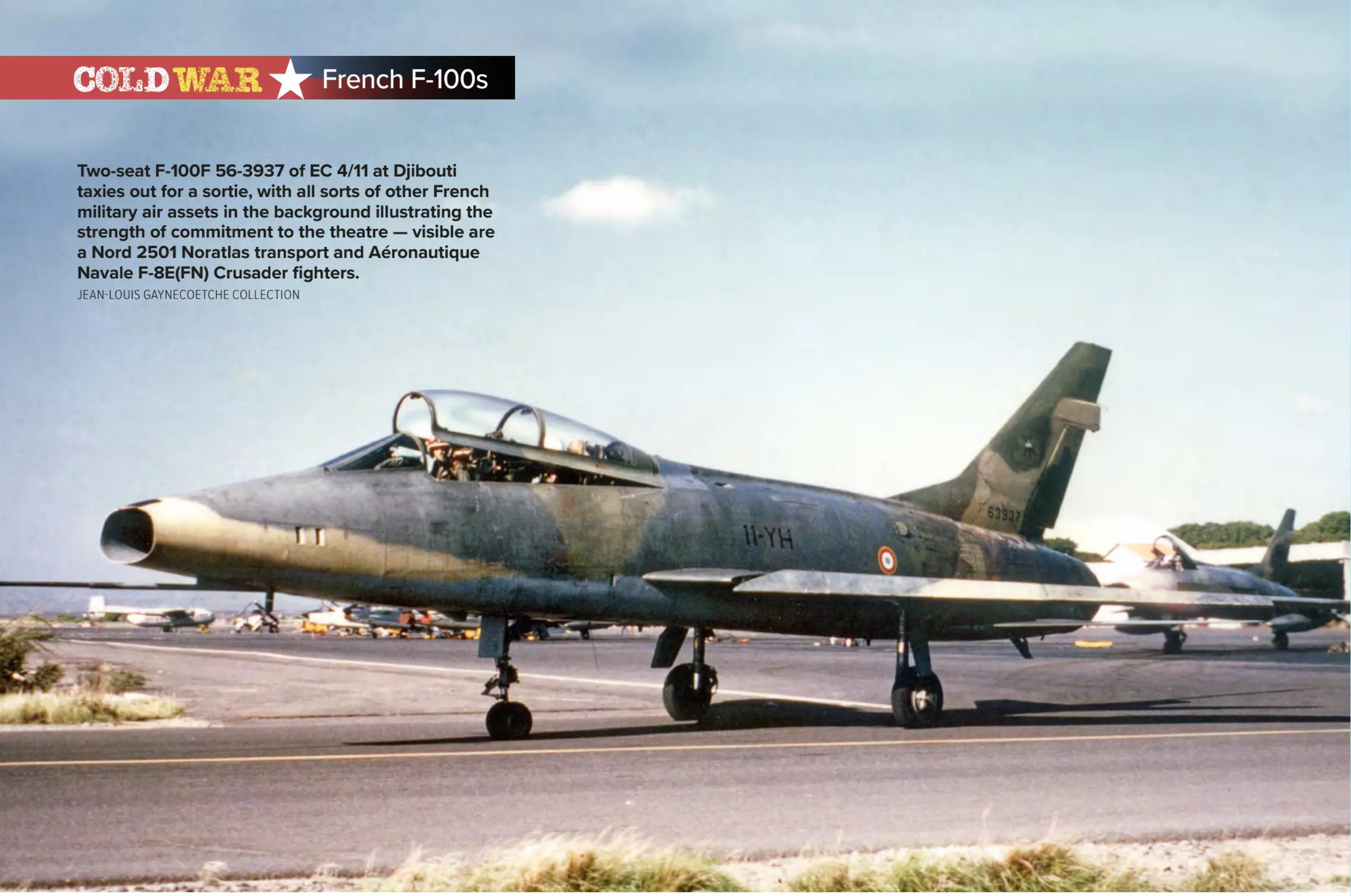
Air force fighter squadrons were then equipped with 15 aircraft each. BA136 was home to three squadrons of Super Sabres: EC 1/11 'Roussillon', 2/11 'Vosges' and 3/11 'Corse'. Out of its 15 jets, 3/11 had nine single-seat F-100Ds and six two-seat F-100Fs. This squadron was responsible for qualifying new pilots and training the unit's experienced hands in air-to-air refuelling.

After a week of intensive ground training on the aircraft and all its intricacies, sitting in front of a mountain of technical orders written in American English, we moved on to the practical part: the flights. We were allowed only four trips in the two-seat F-100F, including the qualification test. If you were passed by the instructor, you could continue your progress. If you failed, you were immediately transferred to the elementary flying training school as an instructor of young pilots.

Before these sorties, we had to take and pass the 'blindfold' test. This consisted of sitting on the ejection seat, blindfolded, with a monitor on the ladder asking where in the cockpit such and such an instrument or lever was located. You might be asked to put your hand on the gun safety catch, the altimeter or the nosewheel steering, for example.

I made my first front-seat flight in an F-100F on 10 November 1970, with 56-3937/11-RK, followed by a second trip that day in the

BELOW: The Luftwaffe hosted the 1968 Tactical Weapons Meet at Jever, for which F-100D 54-2223 was part of the EC 2/11 contingent.
CYRIL AVINENS COLLECTION



Two-seat F-100F 56-3937 of EC 4/11 at Djibouti taxies out for a sortie, with all sorts of other French military air assets in the background illustrating the strength of commitment to the theatre — visible are a Nord 2501 Noratlas transport and Aéronautique Navale F-8E(FN) Crusader fighters.

JEAN-LOUIS GAYNECOETCHE COLLECTION

same aircraft with the same instructor. The use of the two-seater was specifically focused on the landing sequence. The F-100 was a difficult aircraft to land, due to a number of factors such as the need to maintain a precise landing speed depending on the weight and therefore the remaining fuel, and the brakes, which were more like retarders. For this reason, the F-100 was fitted with a drag 'chute, but it tended to fall off if the handle was not operated correctly.

To put it simply, you had to be at 300ft, 165kt and 85 per cent engine power on the runway heading 1nm from the intended touchdown point. In order to attain 165kt, we had to add 3kt for every 1,000lb of fuel remaining at a weight of 1,200lb and add half the crosswind component without ever exceeding 185kt. At touchdown, you had to simultaneously reduce the engine to idle — at which it was still pushing out 1,500lb of thrust — put the nosewheel on the ground, engage the nosewheel steering, use the rudder pedals to counter the crosswind, extend the speed-brakes, retract the flaps and deploy the parachute. As a result, if you landed a little too fast and a little too long, if the surface was wet and the drag 'chute popped, you'd end up in the end-of-runway barrier...

All of this successfully negotiated, I had my first flight in the F-100D, the single-seater, on 17 November 1970 in 54-2293/11-RL. This aircraft was a very potent fighter-bomber, and in 1970 Toul-Rosières was the only French base equipped with it. It commanded a great deal of respect because of its size and the noise it made on take-off when the afterburner was engaged. Indeed, the special feature of this engine was that the 'burner went straight from zero to full reheat, and it was through the dry engine speed that the pilot controlled the power.

A shortcoming for the air defence mission was that it had automatic leading-edge slats using a spring system. They would extend at a speed of 290kt but only retracted at 300kt and above, which was a handicap during combat manoeuvres. At least the cockpit was very spacious, compared to the Mirage IIIE I later flew. In its air defence configuration, the F-100 carried four AIM-9B Sidewinder air-to-air missiles in addition to its four 20mm cannon. It was equipped with four Pontiac M39 20mm cannon with 200 shells per weapon. The two-seat F-100F had only two guns of the same calibre.

> ***“It was a potent fighter-bomber and commanded respect”***

Able to take a lot of fuel, the aeroplane had three 'wet' pylons under each wing. The French F-100s were not equipped with 450-US gallon drop tanks like the USAF machines, but it was common practice to carry additional 275-US gallon tanks and jettisonable 200-US gallon canisters. As the 275-gallon versions could not be topped up via in-flight refuelling, they were replaced on this type of mission by 335-US gallon tanks. Sorties involving in-flight refuelling were carried out in the 1970s by experienced pilots who had trained as part of the CAFI (Composante Air de la Force d'Intervention) alert and taken part in numerous exercises in African countries that had signed defence agreements with France, such as Senegal, Chad, Madagascar and Djibouti.

The autumn weather in Lorraine is not conducive to low-level flying by recently qualified pilots. That's why, in November, part of the squadron flew to BA125 Istres for a traditional winter detachment with eight F-100s, including a pair of two-seaters. There we improved our proficiency with the Super Sabre during long, low-level navigation exercises. As EC 3/11 'Corse' was the conversion squadron, I was transferred to 1/11 'Roussillon' for the rest of my time on the

F-100. The following Monday I left for Istres with my new unit, again with eight aircraft. The training there was as intensive as ever, but we didn't fly on 7 November 1970, the date of Gen de Gaulle's death, before returning to Toul on the evening of the 15th.

In those days, our fighter wings included a squadron of second-line aircraft like the Fouga CM-170 Magister, Lockheed T-33, Max-Holste MH-1521M Broussard and Dassault MD-312 Flamant. We had to fly the first two of those, so in January 1971 I logged 13 hours in the F-100, six hours 10 minutes in the T-33 and one hour 15 minutes in the Fouga. When flying the Super Sabres we alternated between high-altitude air defence missions and low-altitude sorties followed by firing our guns or rockets on air-to-ground ranges like Suippes, in north-eastern France, mainly in single-seat F-100Ds. Looking at my logbook for February, there were 20 hours in F-100s and two-and-a-half hours of Fougas, while March brought 27 hours 15 minutes of Super Sabre time during several national exercises, plus the Fouga for two hours 10 minutes. April was our last month on the F-100, with a trial mission to and from BA126 Solenzara in Corsica led by the squadron CO, and three-and-a-half hours in the Fouga.

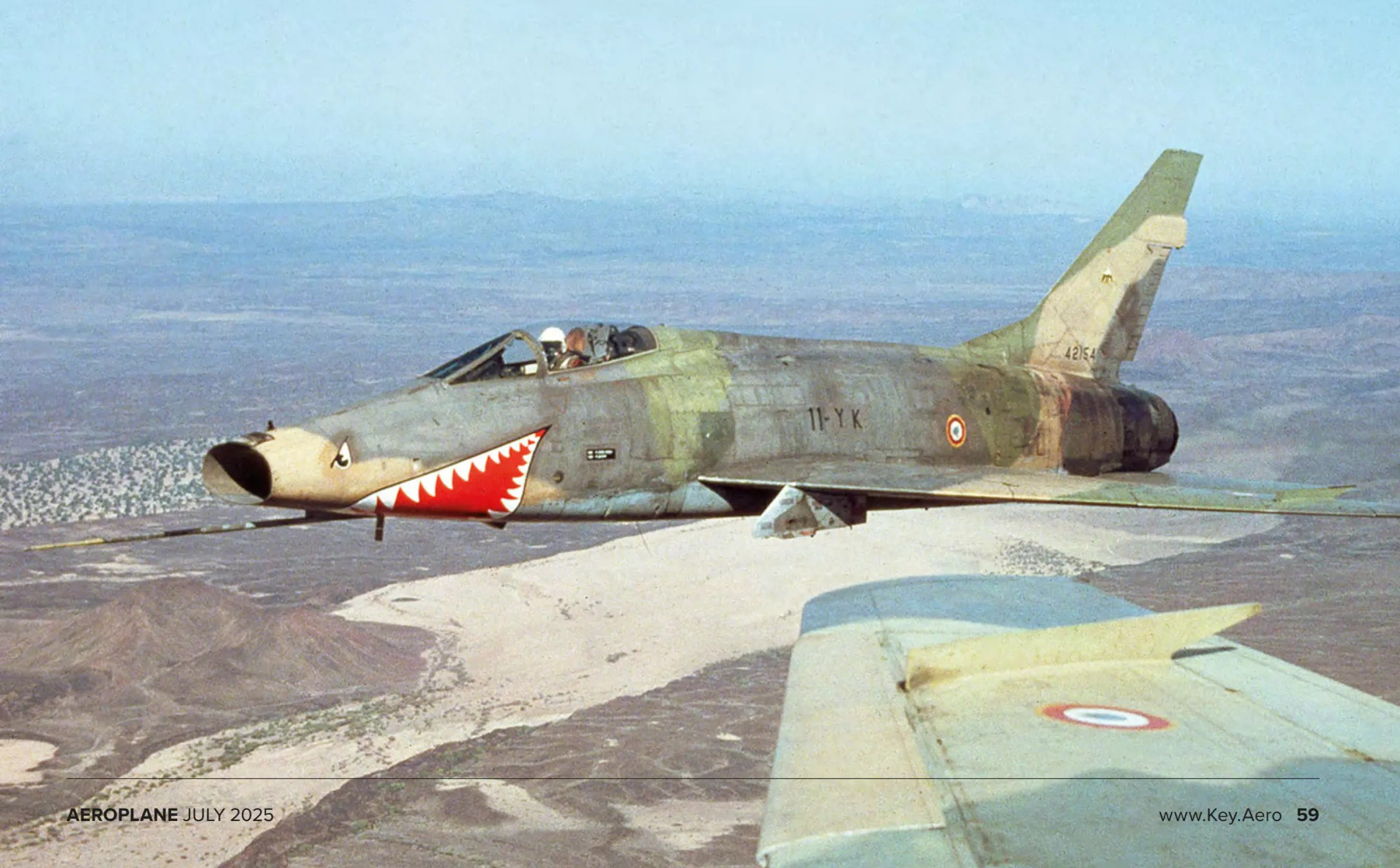
> ***"What a great joy it was to savour the F-100 for one final time"***

Why so long flying the Magister, mainly at night? The reason was simple: as we were due to convert to the Mirage, we had to accumulate at least 50 hours of night flying before we could be declared operational on the Mirage at night, and on leaving flying training we only had around 20. This explains the race for night Fouga hours after our daytime activities on the F-100.

I had my last F-100D flight on 8 April 1971 with serial 54-2267. For the record, with another pilot behind the stick, this example went off the runway on 13 April during a 'difficult' landing and was never repaired. It was struck off charge at Toul on 8 January 1973.

But the story wasn't quite over. I transferred to the Mirage on 3 May 1971 with EC 2/2 'Côte d'Or' at BA102 Dijon-Longvic, and went from there to EC 2/3 'Champagne' flying Mirage IIIEs from BA133 Nancy-Ochey, just 20km from Toul-Rosières. Owing to work on the runway at Nancy in August 1976, we found ourselves being detached to Toul. On the morning of the 10th, at breakfast time in the officers' mess, we — a comrade who had also flown F-100s and I — were told that three F-100s, one single-seater and two two-seaters, were going to be handed over to the USAF at RAF Sculthorpe. No sooner said than done, with the agreement of our squadron commander we asked the 'boss' of the 11ème Escadre to let us both slip into the back seat so we could enjoy a last Super Sabre sortie.

So it was that I climbed into F-100F 56-4009 for a memorable flight at the controls, from the rear seat, of this aircraft in which I had already notched up 16 hours five minutes in the course of 12 sorties with EC 1/11 in 1970-71. We returned to Toul-Rosières that evening aboard a Nord 2501 Noratlas with the mechanics who had welcomed us to the UK. What a great joy it had been to savour for one final time the F-100 in the French Air Force.



Over Djibouti in June 1978, F-100D 54-2154 displays the shark-mouth markings applied to the EC 4/11 'Huns' during their latter days.
JEAN-LOUIS GAYNECOETCHE COLLECTION

LIFTING

Farnborough, September 1992. The Cold War was over, the Russian aerospace industry was present in full force. Its appearances at previous SBAC displays had broken new ground each time, yet this was exceptional. No fewer than 20 aircraft from the major manufacturers, several never seen in the West before, made for a considerable show of strength. This was just over a year after the Moscow coup that precipitated the collapse of the Soviet Union, and a new, capitalist Russia was seeking to do business. Some of its aeronautical wares, such as Sukhoi's unlimited aerobatic aeroplanes and the Rolls-Royce RB211-engined Tupolev Tu-204 twin-jet airliner, were obvious prospects for foreign sales; the Tu-22M3 'Backfire' bomber, despite its touted availability, less so. Yet this powerful delegation also aimed to promote the value of Russian knowhow, and it was this which piqued one onlooker's interest.

Art Nalls was then a major in the US Marine Corps. One of the service's most experienced Harrier pilots, both on the first-generation AV-8A/C models and the newer AV-8B, as of 1992 the US Air Force Test Pilot School graduate was posted to Naval Air Systems Command. It was during this time he learned of Russia's intention to exhibit its newest V/STOL jet at Farnborough. The

THE LID

By the time the Cold War ended, Yakovlev had amassed a great deal of knowledge in the field of vertical lift propulsion. Could it sell that expertise to the West? One of the American pilots who flew the Yak-38 jet V/STOL fighter and evaluated its Yak-141 successor tells the story

WORDS: BEN DUNNELL

The Yak-141, in the form of the first prototype, displays at Farnborough in 1992 — the 'Freestyle's' sole Western outing. ALAMY

Yakovlev Yak-141, codenamed 'Freestyle' by NATO, would be among those Western debutants. Indeed, it had never been shown in public before. With it would come an example of its Yak-38 'Forger' predecessor, in Soviet Navy service since 1976. Not for anything was this opportunity to be passed up — by either side.

Put simply, in the aircraft that was dubbed the Yak-141 by the time it took its international bow, but which had hitherto been the Yak-41, Russia had a V/STOL jet with supersonic capability. This it achieved through the R-79V-300 afterburning lift/cruise engine developed by AMNTK Soyuz. There had been experiments in the West towards that end, perhaps most notably by Bristol and Rolls-Royce with PCB (plenum chamber burning) versions of the Pegasus, but nothing had ever taken to the air. Achieving a maiden flight of the first Yak-41 prototype as far back as 1987 was a significant achievement given the technical challenges. Suspension by the Soviet Navy of its interest in the programme during 1991 helped prompt the search for new partners, and in the US there was potentially a ready audience.

"At that time", says Art Nalls, "the United States was looking to build the next generation of V/STOL, which ended up being the

RIGHT: Art Nalls in the Yak-141's cockpit. The report written by him and NASA pilot Mike Stortz said this aircraft's instrument panel was "borrowed 'off the shelf' from a MiG-29 to save prototyping costs". It also lacked a head-up display, being fitted instead with a panel containing a flight test air speed indicator and a small array of indicator lights, probably connected to test instrumentation. VIA ART NALLS

STOVL [short take-off and vertical landing] variant of the F-35. We wanted an airplane that had supersonic capability and much-improved maintainability, and to fix some of the issues that we saw as problems with the Harrier. An engine change in an F/A-18 can be done relatively quickly; for a Harrier engine change you have to disassemble the whole airplane. And we wanted to improve the aerodynamics based on what we had learned with the Harrier. It was a game-changer as far as aerodynamics were concerned. Nobody ever knew about intake momentum drag, for example, and the destabilising force of that until the P1127, the Kestrel and the Harrier.

"The Yak-141 was a testbed for aerodynamics and for performance. Nobody really cared what avionics it had because, like computers, they date weekly. We were interested in the engineering that got to it, because there were parts they had already demonstrated they had done which we hadn't done yet. One was the three-bearing swivelling nozzle they had on it. Rolls-Royce had tried that and it was very difficult to get the bearings to seal, especially at full afterburner". Incidentally, Pratt & Whitney had also explored such a nozzle back in the 1960s for the Convair Model 200 naval fighter, but this did not proceed.

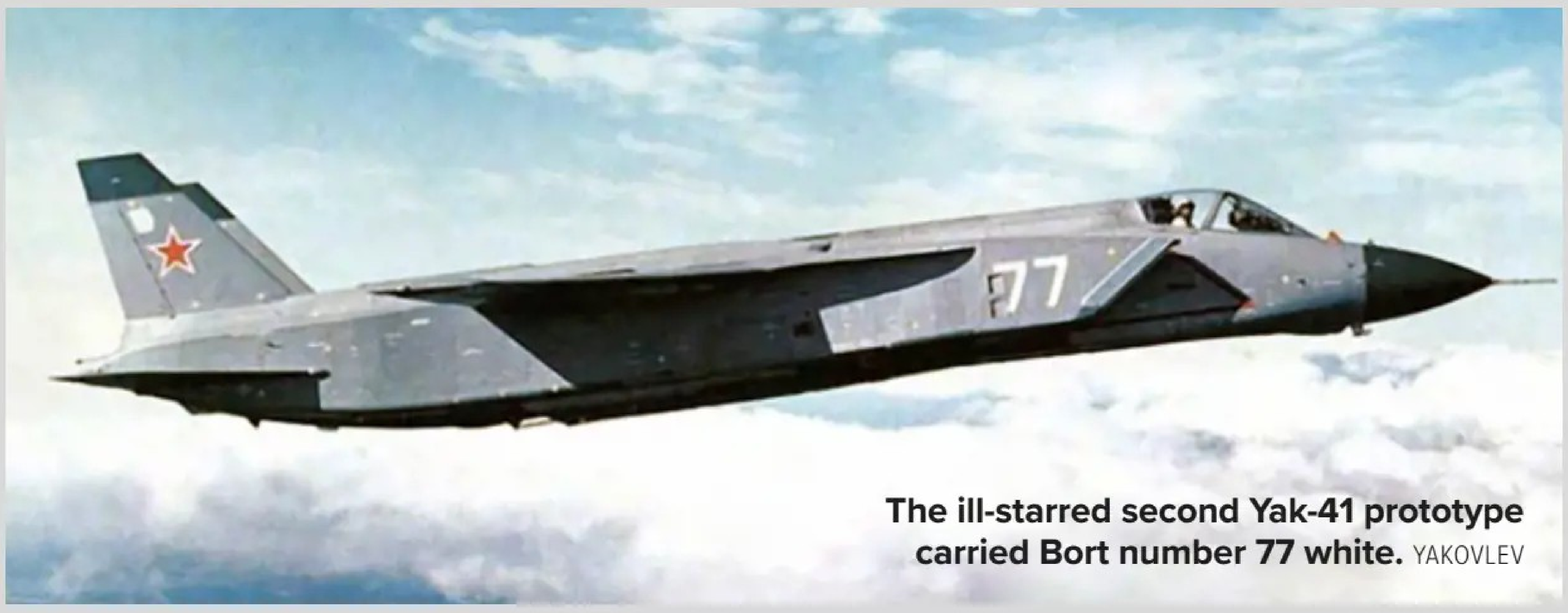
"Especially in the V/STOL environment with an afterburning engine", continues Art, "you've got materials issues, you've got temperature issues, you've got noise issues for people standing close to the airplane, you've got an environment there that will absolutely wreak havoc on aluminium and the steel flight deck of a ship. All of those were of interest to us. How had they handled them, what were their solutions?

"The other parts were the [Zvezda K-36VM] automatic ejection system, which we thought was of

'FREESTYLE' MOVES

Even before the Yak-38 had flown, the Yakovlev Design Bureau's thoughts had turned to a far more capable successor. Development of such an aircraft was launched at state level in June 1974, this followed in November 1977 by the formal order to Yakovlev and engine manufacturer AMNTK Soyuz to go ahead with the Yak-41 and its R-79V-300 powerplant. But a 1982 deadline for entry into state testing passed by, owing to delays in perfecting the vectored-thrust nozzle. Not until 9 March 1987 did the first prototype Yak-41 take to the air at Zhukovsky, in conventional mode only, with test pilot Andrey Sinitsyn at the controls. Hovering trials started during December 1989, and the initial transition took place the following June.

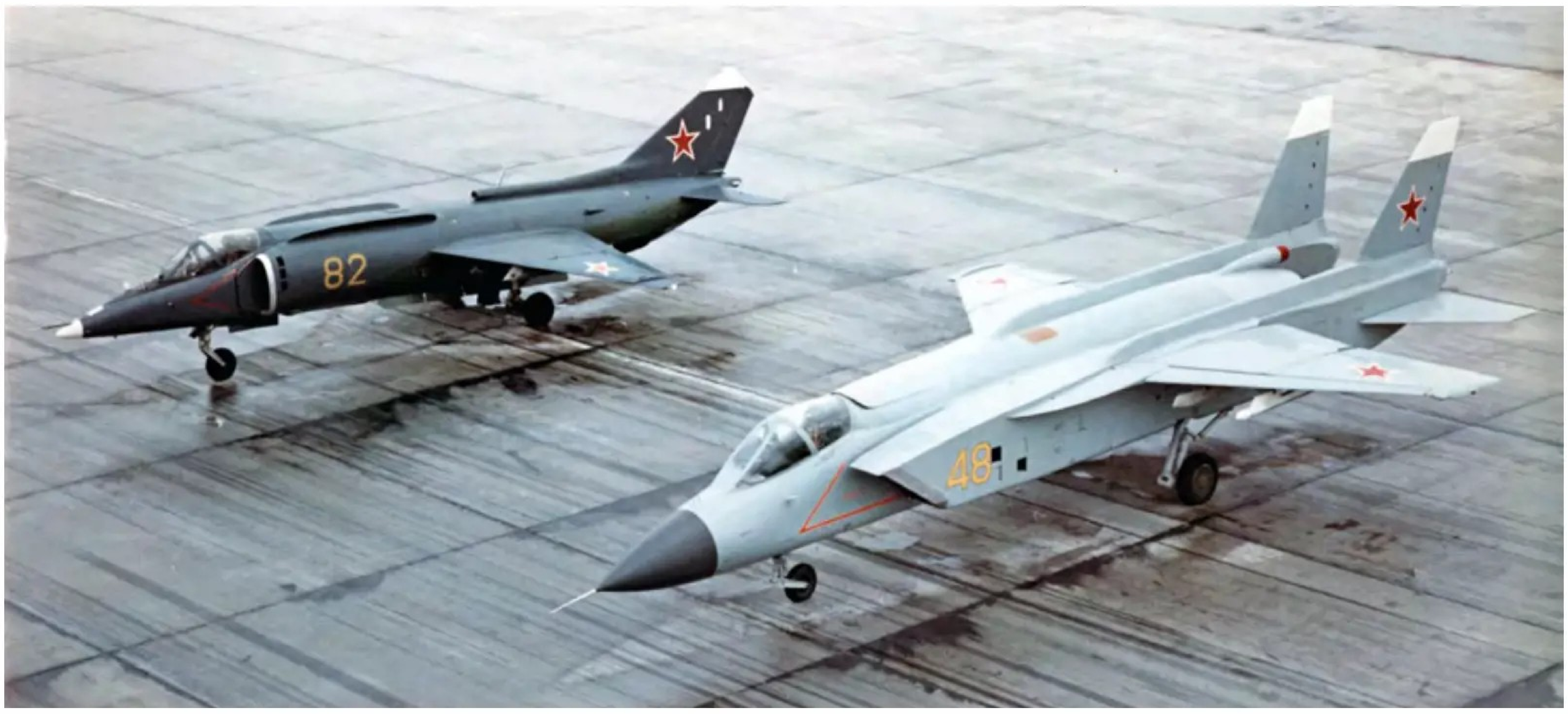
Four airframes were built: two static test examples and the pair of flyers. Once some hot gas recirculation problems were ironed out, flight-testing proceeded well. Though the intended Mach 1.7 maximum was never attained, a dozen FAI-ratified time-to-climb, payload and altitude records for a V/STOL type in its class were set by Sinitsyn in April 1991. The Yak-141 designation began to be used at this stage and was adopted by the manufacturer. Carrier trials aboard the newly renamed *Admiral Gorshkov* — formerly *Baku* — began that September. Here things went wrong for the second aircraft, when on 5 October it suffered a hard landing on the ship. An inadvertent cancellation of the afterburner in V/STOL operations may have been a factor.



The ill-starred second Yak-41 prototype carried Bort number 77 white. YAKOVLEV

But, in any case, the programme was effectively doomed by 1991's political turmoil and the collapse of the USSR. Before the end of the year, military funding was curtailed by the Kremlin. Yakovlev alone couldn't sustain it for long, and when Western backing was unforthcoming the very promising Yak-41/141 was consigned to history before a production model could be built.

Both flying prototypes survive in preservation, the second at Monino, the first in Vadim Zadorozhny's Technical Museum west of Moscow.



LEFT: Yak-38 (left) and Yak-41 compared, the latter in the form of a non-flying testbed. It exhibits four underwing hardpoints, intended primarily to carry AA-10 or AA-11 air-to-air missiles for the type's main role, but also bombs or rockets. These two types built on the design bureau's success in creating the USSR's first V/STOL jet, the Yak-36 technology demonstrator, which had taken to the air in January 1963. YAKOVLEV

great interest, and the flight control system. I didn't know anything about the automatic ejection system, but it had a 100 per cent success rate [on the Yak-38]. At first there was some pilot inertia against it — why do you want to have a system that automatically will spit you out under certain circumstances, and why would you give that authority to a computer? Then after they'd had multiple successful ejections, there was a complete reversal of pilot attitude and thinking, and they would not fly without it; 'if that's not working, we're not going'.

"If you look at the US Harrier flight manual, which we call a NATOPS — Naval Air Training and Operating Procedures Standardization — to see procedures for the ejection seat, there is a multitude of charts for bank angles, nose-down pitch, sink rate and so forth where the ejection seat had been tested to give you a safe ejection. There's no pilot in the world who can memorise all of those things and recall them in a dynamic environment where they're doing their best to try and control the airplane. The Russian system took all that completely out of the loop, because it monitored all those parameters.

"Basically it was like the most experienced instructor in the world in a two-seat airplane saying, 'You know, we're getting real close to the edge of the envelope here, we're getting closer, we're getting closer, if you don't eject now you're not going to make it'. It would wait to the last minute, where your chances of a successful ejection were the highest, and then automatically eject them. The pilots came to realise that had the system not ejected them right then and there, they would have died… In the case of the Yak-38, which had two lift engines in the front and one main lift/cruise engine in the back, if any one of them failed in the hover you were not going to survive. You had three points of failure that would lead to disaster, and this system picked up on the instantaneous rate of change and the rate of rate of change. A pilot can determine the rate of change through the seat of the pants, but not the rate of rate of change.

> ***"The automatic ejection system had a 100 per cent success rate"***

"We didn't really know how the Yak-38 hovered; we didn't know what the pilot did to make it hover. But we did know that when the airplanes were hovering they appeared to be very stable, very secure, whereas the Harrier looked like it was a little wobbly in wind and deck situations. There was obviously something to learn from that, and how they'd made it better in the Yak-141. It was very impressive, I thought."

There was only so much that could be gleaned at Farnborough, even as a result of Art Nalls speaking to the Yakovlev representatives and being given a detailed tour of the Yak-141, including the chance to sit in its cockpit. But once he returned to the States, further discussions led to Alexander Dondukov, Yakovlev's chairman and chief designer, issuing an invitation. In June 1993, Art and NASA test pilot Mike Stortz, himself a former US Marine Corps AV-8 pilot, headed to Moscow for an evaluation no Westerners had previously been afforded. At Zhukovsky, the Yak-141 was subjected to a full assessment — and its simulator flown — while the two men were given familiarisation flights in a two-seat Yak-38U.

For Nalls, his 'Forger' trip came on 30 June, accompanied by LII flight test centre chief pilot Viktor Zabolotsky. What preconceptions did he have concerning the earlier-generation V/STOL aircraft, which had endured a troubled land-based operational deployment to Afghanistan in 1980 and went on to serve aboard the Soviet Navy's four Kiev-class carriers? "We thought it was very limited in performance and limited in capability", he says. "At that point it really wasn't a competitor to the Harrier at all. It was far inferior, and if we ever had to engage it as a fighter the Harrier would win hands-down". Experiencing it for himself dispelled a few of those notions.

Both he and Stortz, who flew with Yakovlev test pilot Yuri Mitikov, completed similar flight profiles as chosen by the Russians: a conventional take-off using the main Tumansky R-27V-300 engine with 18,000lb thrust, a decelerating transition to a hover, an accelerating transition to conventional flight and limited

ABOVE: On the Zhukovsky tarmac, groundcrew assist Art Nalls and Viktor Zabolotsky, chief pilot of the LII flight test centre, in strapping into Yak-38U Bort 47 yellow. The trainer's unusual appearance, with the long nose angled downwards, was intended to give the back-seater a better view. VIA ART NALLS

wingborne manoeuvring flight before a conventional landing. There could be no vertical landings owing to the lack of a prepared metal surface. "First impressions of the aircraft highlighted a lack of control harmony", said their subsequent report. "The aircraft was very heavy in pitch, requiring an estimated 20lb for a 3-4g turn. Yaw control was also very heavy and the aircraft appeared directionally loose, yet very responsive in roll."

Setting-up for the decelerating transition began some 3nm out, when the undercarriage was lowered at 324kt. With speed down to 243kt, a yellow lever in the cockpit was moved to the 'vertical' setting — the other was 'STOL' — to start the 7,800lb-thrust Rybinsk RD-36 lift engines. "Lift engine start is completely automatic", the pilots reported, "from opening the inlet and exit doors, starting engines, and reconfiguring the flight controls to ACAH [attitude command attitude hold] laws."

There were 1.5 miles to go when a switch on the stick was used to lower the nozzles. Attitude remained constant during the transition, while a stabilised hover "was easily controlled". Pitch response was deemed "sluggish, but reasonable", roll control "responsive and predictable", but yaw control "sluggish, underpowered and the major deficiency of hover control". A surprise was how "smooth and responsive" height control was with a single throttle controlling three engines, the lift engine thrust being "scheduled by the flight control computers as a function of air speed, main engine nozzle angle and throttle position". Operation of the two RD-36s was limited to three minutes to prevent them overheating. "Overall", they said, "the aircraft felt smooth and stable in hovering flight with very low workload."

The accelerating transition took just 30 seconds, after which the manoeuvring flight that was permitted brought no great surprises. Landing off a "long, shallow" straight-in approach, the aircraft was felt to be "quite loose about all axes and large, frequent stick inputs were required to maintain course and glideslope. Speed stability was good, as few throttle inputs were required to maintain speed... Stick activity increased markedly during the flare, requiring frequent, nearly continuous large (near full) stick deflections. Touchdown was positive, but there was some 'lurching' and roll control inputs were required to maintain wings level during the initial part of ground roll."

❖

Generally, the impression gained of the Yak-38U was surprisingly positive. Its handling qualities were described as, "excellent — low workload because of the attitude hold response type and high precision because of the superb integration of the flight and propulsion systems". While manoeuvring performance "was only adequate" and wing-borne handling qualities left "a lot to be desired", the verdict was, "The integration of the flight and propulsion systems for the Yak-38 was ahead of its time. The concept of lift/thrust scheduling as a function of air speed, lift/cruise nozzle and throttle is elegant in its simplicity... Credit is owed to the Russians for their ingenuity and persistence in making this complex system operational with such docile manners."

But, says Art, "we weren't really interested in the Yak-38". The true focus was the Yak-141. "I wanted to play with it in some of the V/STOL realms, but I didn't get too much

RIGHT: As exhibited by single-seater Bort 48 yellow at Zhukovsky in 1991, the Yak-38 incorporated folding wings for shipboard stowage, something the Harrier never had. "That's a tremendously difficult engineering problem for a system that has to work perfectly all the time", comments Art Nalls. Two operational units of the Soviet naval air arm, the AV-MF, flew the type: the 279th and 311th Independent Shipborne Assault Aviation Regiments. GETTY

Although the Yak-38 was retired from front-line service in 1991-92, Yakovlev continued using two-seat Yak-38Us for test and demonstration purposes for several years longer. Bort 24 yellow was put through its limited paces during 1995's MAKS airshow at Zhukovsky. PETER R. MARCH

of a chance… They showed me how to position this little knob in the airplane to make it do what I wanted it to do. When I wanted to do a vertical take-off, that was one position; a short take-off was another, a conventional take-off was another. You would just shift the gears and the airplane did everything automatically. It was reversed for the landing. You moved the knob for a vertical landing, and the airplane did what it needed to do to get you into position for a hover and then a vertical landing. I thought that was brilliant.

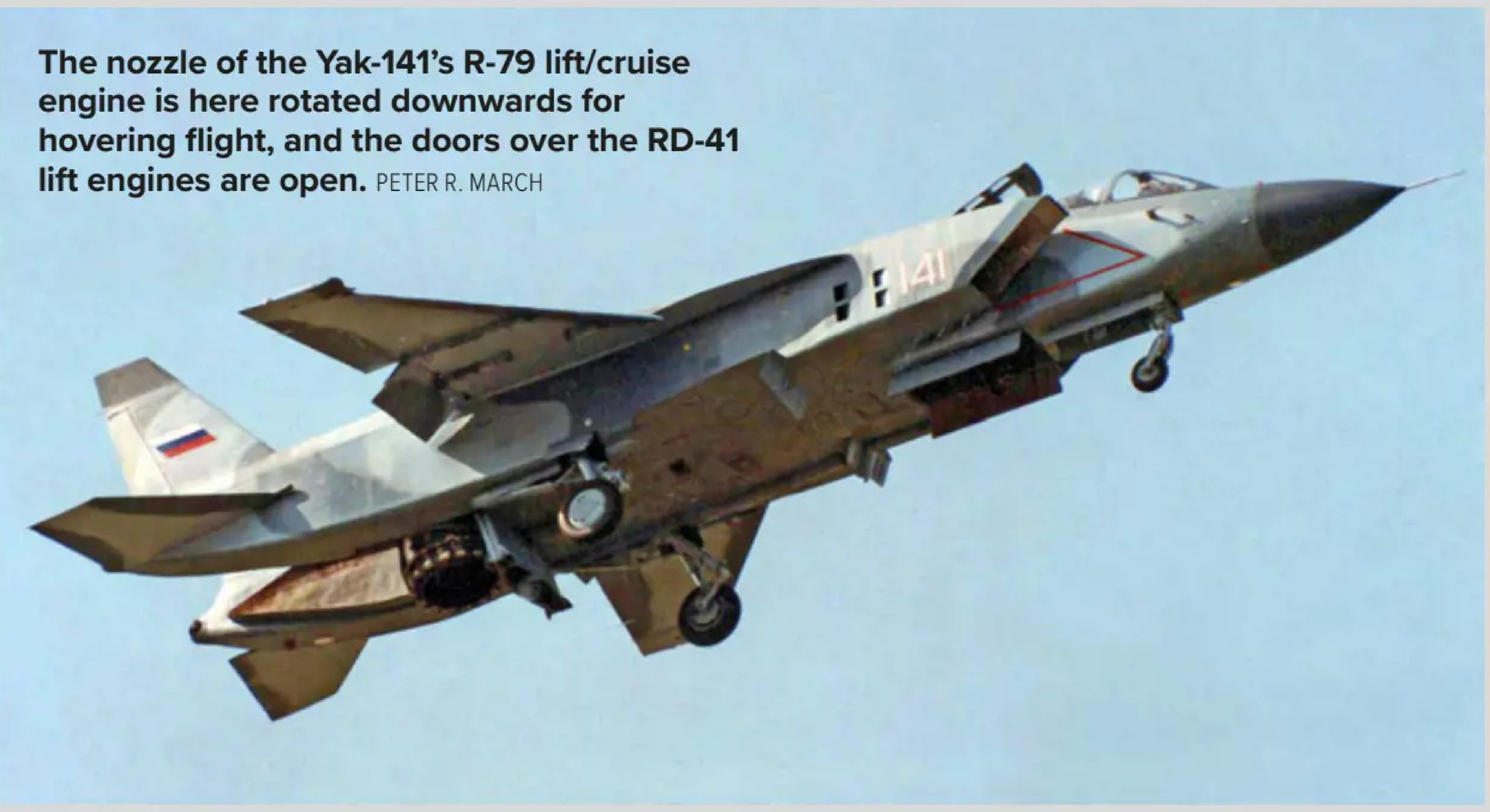
"On the Harrier, we would 'blueprint' every engine/airframe combination. We would do hover checks every 30 days, which did a couple of things. It let you know exactly the health of the engine, because you could track it. If the engine was losing power and you'd got several hundred hours on it, that might lead you to believe you were starting to have some turbine wear and you might take a closer look at it. You would 'blueprint' it every month and figure your V/STOL calculations based on what your engine was doing, how much your airframe actually weighed and what you were going to do with it that day… What the Russians had done was use Newton's equation, f=ma [force equals mass times acceleration]. When the pilot wanted to do a short take-off, for example, he would put the knob into the short take-off mode and slam in full power. The airplane would sense the acceleration forward, which is the ratio of force over mass […] and work out the rest of the calculations from that."

The report Nalls co-authored in 1993 says of the Yak-141, "For vertical flight the two lift engine nozzles are toed-in to prevent a jet fountain forming between them and causing hot gas ingestion of the lift engine cavity… pitch is controlled through differential thrust but since the main engine is operated in afterburner for V/STOL flight, the ground environment is extremely harsh. The STO [short take-off] is accomplished in like manner to the Yak-38 through lift-off; however in addition to the manual accelerating mode, the flight control system can automatically control the main engine nozzle to achieve an

BALANCE OF POWER

The main R-79 engine on the Yak-141 was described as being in the 35,000lb thrust class and had a single vectoring nozzle, on which the afterburner could be used at any thrust angle. According to the report by Art Nalls and Mike Stortz, "Thrust vectoring is accomplished by means of two counter-rotating 'stove pipe' sections between the core and afterburner and the vectoring range is from -10 degrees to 95 degrees with respect to the aircraft waterline… The rotating nozzle is convergent only and when rotated down is very close to the landing surface, creating a very harsh ground environment. Surface requirements are reported no more stringent than for the non-afterburning Yak-38 which requires either a tile or steel surface, [but] very little testing has been done in this regime."

As for the two 9,200lb-thrust Rybinsk RD-41 lift engines, which had been "adapted from a conventional, horizontally mounted engine", their nozzle system was able to vector through ±12.5°. "The combination of the vectoring capability and the installation angle of 10 degrees forward provides a total vectoring range of 2.5 degrees forward to 22.5 degrees aft, as measured from the vertical…



The nozzle of the Yak-141's R-79 lift/cruise engine is here rotated downwards for hovering flight, and the doors over the RD-41 lift engines are open. PETER R. MARCH

"As before, all engines are integrated into a single throttle and the thrust vector angle of the main engine is controlled through a thumb actuated switch on the control stick, similar to the Yak-38… The only mechanical link in the entire system is the throttle to main engine and it is used for backup. The response type is similarly ACAH [attitude command attitude hold] in V/STOL flight using differential engine thrust for pitch control and trim. A bleed air RCS [reaction control system] provides control in the lateral and directional axes. The first aircraft had a tail boom ejector RCS for directional control… However, directional control was reportedly poor and the second flying prototype was improved with a nose-mounted RCS which provided greater control power through a longer moment arm."

RIGHT: The 1993 visit to Zhukovsky allowed Art Nalls to sit in the Yak-141, but not to fly in it. VIA ART NALLS

optimum accelerating transition. In this automatic transition, nozzle angle is reduced in increments, of approximately 10 degrees, and aircraft air speed and altitude referenced by the flight control computer to prevent a settle. Although supersonic performance is achieved and good handling qualities are retained, the landing environment is extremely hostile, due to the afterburner, and is a major deficiency."

Conclusions overall were favourable. "In the spectrum of powered lift configurations, the Yakovlev aircraft provide valuable information on dedicated lift systems and the ground environment of thrust augmented lift systems. The Russians have made trade-offs to acquire a supersonic configuration with a significant vertical payload. The downside of the trade-off is a logistical penalty for multiple, dissimilar engines and a harsh ground environment that carries its own logistical requirement. In summary, the experience afforded by this Russian V/STOL technology assessment will guide us as we develop the next generation of powered lift jet aircraft". But did it?

Coverage at the time, and certain accounts since, have made much of Lockheed's interest. Farnborough briefings from 1992 had Yakovlev seeking a Western partner, but there is no truth in accounts saying a deal was concluded. As late as 1995, though, agreements were announced whereby Yakovlev and Soyuz would provide what had become Lockheed Martin with relevant data and information towards its offering in the JAST (Joint Advanced Strike Technology) competition. This became the JSF (Joint Strike Fighter) project, giving rise to the F-35. In both cases the flow went only in one direction, was fairly short-lived, and didn't cost the the American manufacturer much. Notions of its Russian counterpart making a major contribution to the STOVL F-35B are wide of the mark.

Yet, in those hopeful early-1990s days, things could have been so very different. As Art Nalls says now, "At that point in time, the Soviet Union had dissolved and it was all up for grabs. We didn't have to go steal it — we could buy it. We bought a report virtually for milk money on their automatic ejection system, which they shared with us in the hope of continued engineering collaboration. They were ahead of us in some areas and willing to work with us, but politics got in the way."

It was doubly frustrating for the Russians, given their search for hard currency now the Cold War's end had shut off so much of their industry's existing defence business. "It was all based on money", reflects Art. "Every government has to face that: we would love to do this, but we can afford to do this. We've got champagne ideas but we have to live with a beer budget. They were asking for George Washington on a piece of paper. They wanted US dollars. They weren't asking for access to our laboratories, they weren't asking for access to our computer systems. They were giving us everything. The average Russian engineer at that time was working for US$50 a month. Some were working for less.

"The Russians thought the future would be with us. They were looking toward a business relationship, but the politics weren't going to allow that. I got shut down on a couple of things when I said, 'Why wouldn't we want to take a look at this?' The response was a very loud, 'Because they're Russian.' I thought, let's find where the common ground is. They can benefit, we can benefit — and let's make sure we benefit a little bit more."

> ***"They were ahead of us in some areas, but politics got in the way"***

BELOW: Only conventional take-offs and landings were made when the Yak-141 — which, like the Yak-38, was airlifted over from Russia in an Antonov An-124 transport — gave its one public display during Farnborough week. Reports at the time said a rehearsal had damaged the airfield surface. PETER R. MARCH

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PART TWO

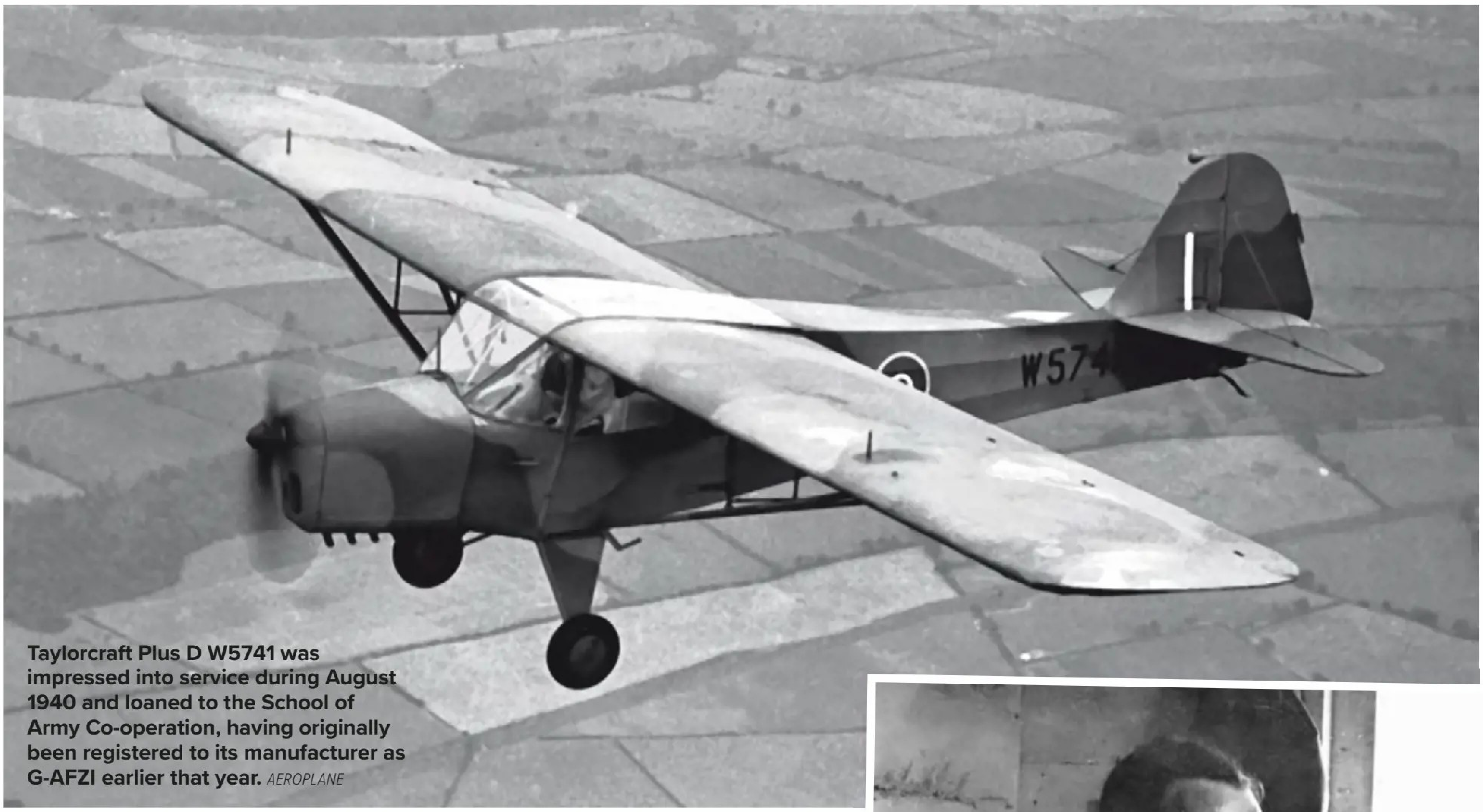
FLYING SOLDIER

Flying his little Aeronca C2, as described last month, convinced senior Royal Artillery officer Jack Parham of the merits of using light aeroplanes to direct fire against the enemy. When war broke out, he was among the greatest advocates for this important capability, as best exemplified by the early Austers — but Parham and others had a long struggle to bring it about

WORDS: DAVID HALFORD

WILTSHIRE AND SWINDON HISTORY CENTRE

Some of the qualities that made the Auster such a fine AOP platform being demonstrated at the Rearsby factory airfield in September 1943 by Auster III NJ747. AEROPLANE



Taylorcraft Plus D W5741 was impressed into service during August 1940 and loaned to the School of Army Co-operation, having originally been registered to its manufacturer as G-AFZI earlier that year. *AEROPLANE*

Two gunners key to establishing the Royal Artillery Flying Club at High Post, north of Salisbury, in November 1934 were particularly instrumental in persuading the War Office of the necessity for what were then known as flying observation posts, or FOPs. They were Brig Hugh Massy of the Royal Artillery's Southern Command and Capt Charles Bazeley. Both ended up being seconded to the Air Ministry to try to improve co-operation with the RAF, which remained distinctly unenthusiastic, unwilling to accept giving up or sharing its exclusive role in aerial reconnaissance. Jack Parham himself eventually joined the club when he returned from India in 1932, before learning to fly on the Cierva autogyro.

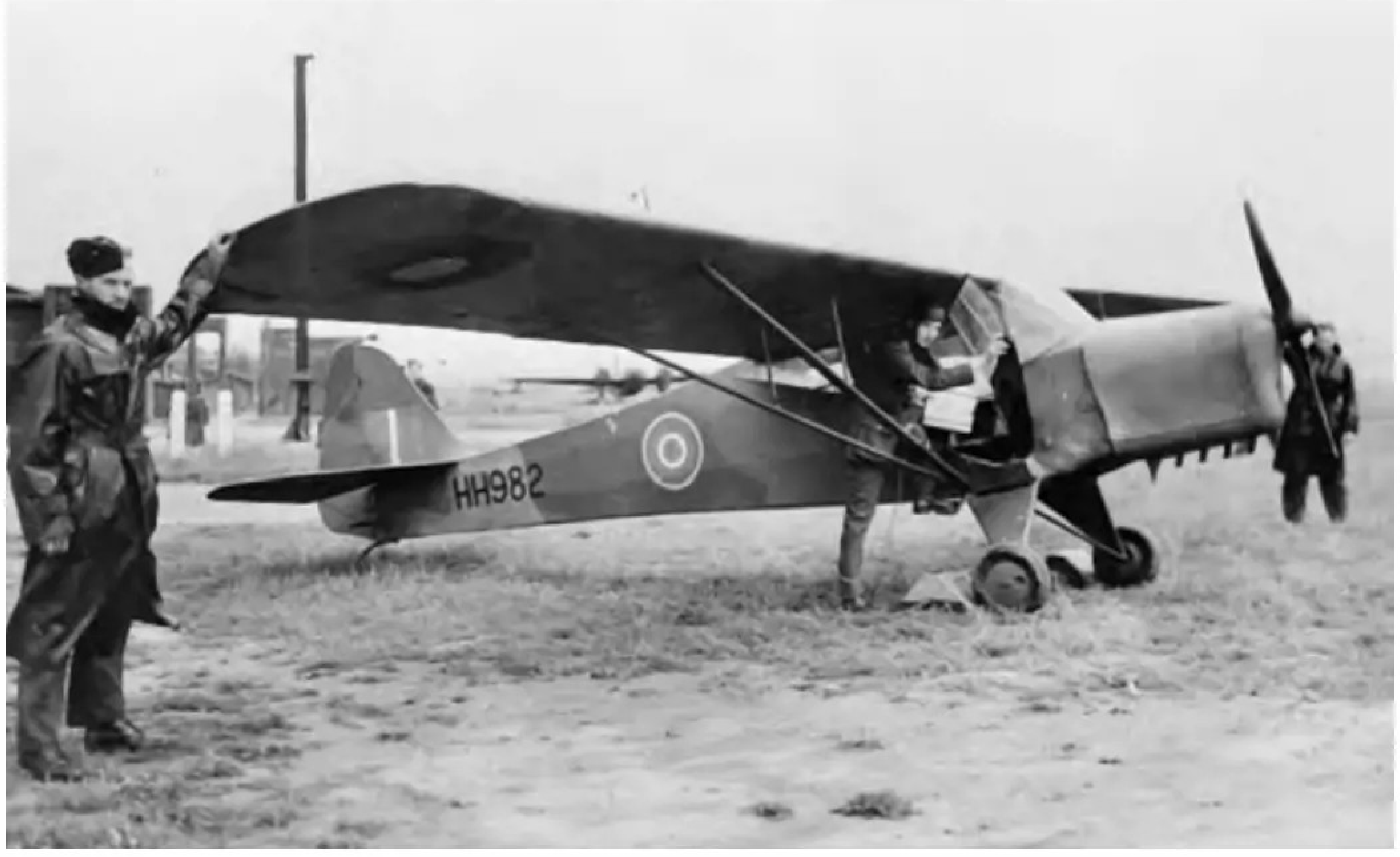
Its advocates felt aerial observation post work required unarmed light aircraft with slow speeds, high manoeuvrability and short take-off and landing distances — a maximum of 100 yards — together with a clear view both up and down, and easily and cheaply repairable airframes. June 1938 saw a formal War Office proposal put to the Air Ministry, which demurred and counter-attacked, saying it simply wanted to improve the RAF's observation procedures instead.

In October 1938 the now Gen Massy became director of military training, and continued to press for the FOP trials. There seemed to be no ideal aeroplane, a February 1939 evaluation showing the Westland Lysander and Hawker Audax to be excessively fast and heavy, so attention switched to lighter types and, potentially, autogyros. It was now that the best contender presented itself. In Leicestershire, the County Flying Club had purchased a Taylorcraft Model A in 1938 and a member, Alexander Wykes, decided to manufacture it. This he did at Thurmaston under the company name Taylorcraft Aeroplanes (England), producing the later Model B, ultimately — if somewhat confusingly — dubbed the Plus C by the British firm. It was powered by a 55hp Lycoming O-145 engine, becoming the Plus D when this was substituted for a 90hp Blackburn Cirrus Minor.

Twenty-three Plus Cs had been built by the outbreak of hostilities, when all civil aircraft manufacturing was suspended, together with the prototype Plus D. Wykes invited Bazeley and a group of personnel involved in the trials to Leicester where, on 20 October 1939, they flew the Plus C and D. The latter, G-AFWN, was much admired. A single example was purchased for testing purposes, and within a week a stored Plus D, G-AFZJ, was made flyable as an interim measure so evaluation could get under way. It was at this point that Bazeley, seeking to prove the viability of an army-flown slow, light aircraft, challenged the RAF to put up two Spitfires to attack him. Neither scored any hits.

Shortly after the declaration of war, Massy was appointed Deputy Chief of the General Staff. Yet again he made the case for FOPs, and by year-end the Air Ministry was grudgingly agreeing to continue the work, if trials continued to be satisfactory. With the Taylorcraft, they were. The initial proper military example, serial T9120, was delivered in December 1939 and two others followed. The RAF duly set up its first FOP unit at Old Sarum in February 1940 as 'D' Flight of the School of Army Co-operation, with terms approved jointly by the War Office and the Air Ministry. Bazeley was made CO,

ABOVE: Brig Jack Parham relaxes in an army caravan post-D-Day. WILTSHIRE AND SWINDON HISTORY CENTRE



RIGHT: Another of the early military AOP aircraft was Taylorcraft Plus C/2 HH981, formerly G-AFVA in private ownership pre-war. Following August 1941 impressment, here it's in use by No 651 Squadron and engaged in training at Old Sarum. ALAMY

joined by three other pilots, two army and one RAF. Augmenting its three Taylorcraft Plus Ds was a single Stinson 105 Voyager, likewise acquired for evaluation.

It was agreed that FOPs would be renamed AOPs, air observation posts, and that the flight would liaise with French forces, which were developing similar capabilities. After initial training with Royal Artillery units, 'D' Flight departed for France on 19 April 1940 for three weeks' intensive work-up at Mailly. Part three of this process was engagement with German units along the Saar, during what became known as the 'Phoney War'. A reconnaissance party was sent ahead to the Saar frontier on 9 May, only to find itself caught up in the Blitzkrieg launched the following day against the Netherlands and Belgium.

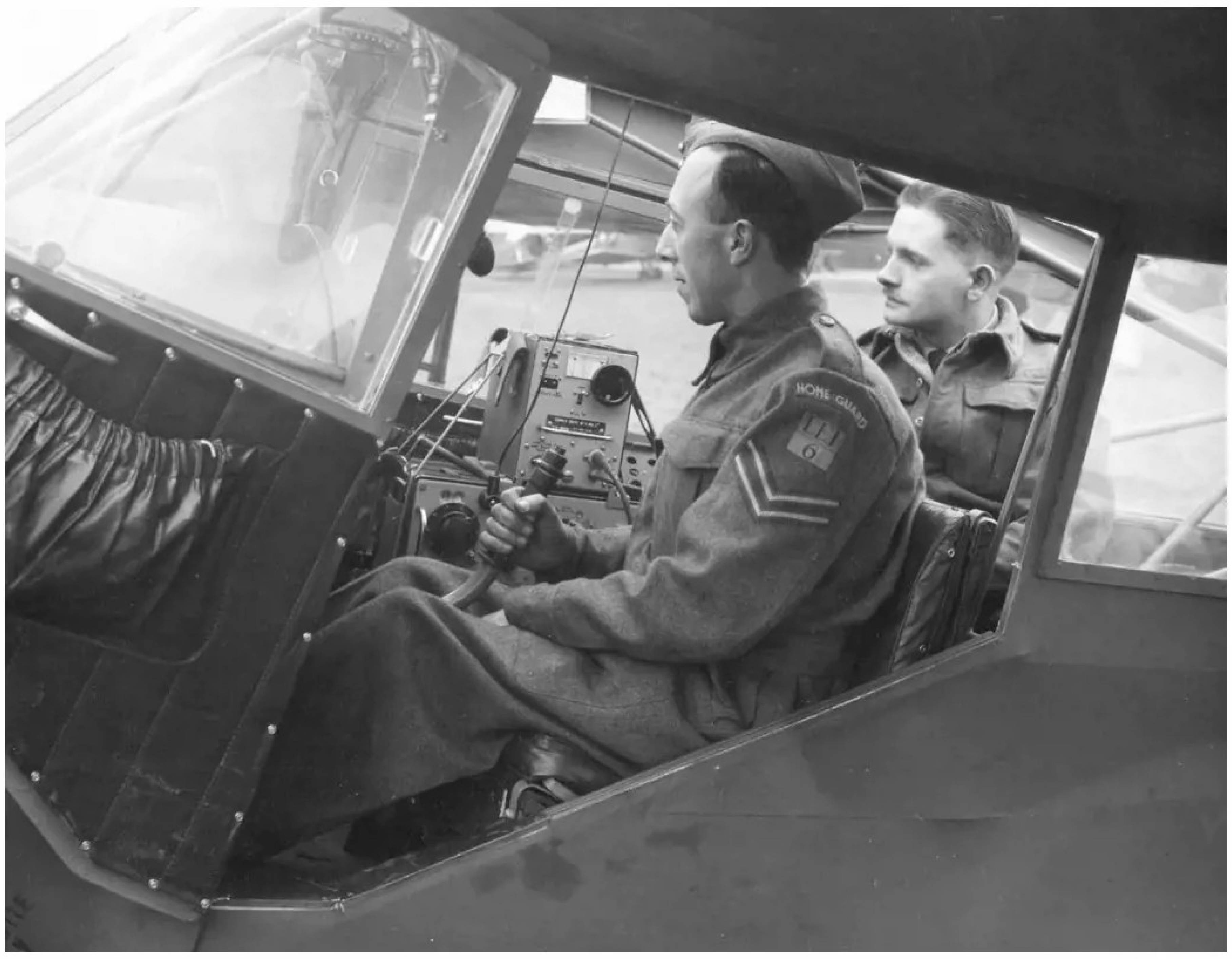
> ***"There was a period when there were awful inter-service troubles"***

The flight waited a week in case the situation stabilised, but it was too fluid, so a decision was made to recall it, and it arrived back at Old Sarum on 20 May. 'D' Flight was later integrated into the newly formed RAF Army Co-operation Command when it was created in December 1940, after the lessons learned during the disastrous French debacle. The Lysanders on observation duties in-theatre were comprehensively eliminated by the Luftwaffe, and the few survivors speedily withdrawn. It had all been too little, too late.

Yet again in the British military, the doughtiest foe was likely to be your own side, and so it appears from Parham's writings: "There was an extraordinarily difficult period from 1939 to the end of 1941 when there were awful inter-Service troubles, and it did mean a very big break with established tradition, that the Army should get its hands on its own flying machines". Ideally for an AOP, a pilot's position in an enclosed cockpit, with a space behind for a radio set, was deemed most appropriate. The supply to gun batteries from 1936 of small two-way radios meant ground-to-air messaging could be both timely and precise. Higher-performance aircraft would inevitably have to be based miles from the front line, whereas the artillery needed prompt, time-critical artillery direction. Otherwise, requests for help and reporting of results risked ending up on a long, slow line of staff air liaison officers passing information and instructions endlessly back and forth.

The absence of even the compromised Lysanders was forcibly rammed home to Parham during the retreat to Dunkirk. He was defending a canal line near Givenchy, his old stomping ground in World War One, but as the troops were pushed back they were unable to have any view along a mile-long stretch of the waterway. A few hours later a unit of some 50 German tanks and accompanying infantry suddenly appeared on the British side of the canal, having crossed out of sight of the British troops. This, when he managed to get back to Britain, gave him and others a chance to work out what the artillery really needed as an observation aircraft, to avoid the same situation repeating.

It was when advancing towards Louvain in Belgium to halt the German advance that Parham was able to ambush a German tank unit in woods close to Wavre, where the regiment concealed itself successfully and poured devastating fire into the enemy with the help of an armoured observation post located in a Bren gun carrier, there being no AOP anywhere near. This set him thinking about the broader application of concentrating artillery 'shoots' in overwhelming numbers, later to be guided by AOPs. In a subsequent note Parham wrote that this demonstration of "quickly massed gunfire made



RIGHT: A member of the Melton Mowbray-based 6th Leicestershire (Quorn) Battalion, Home Guard, tries the front seat of an Auster III for size — and in so doing offers a good view of the type's cockpit, including the all-important radio equipment. *AEROPLANE*

LEFT:
In Italy during April 1943, the pilot of Auster III MZ108 from No 654 Squadron receives his orders.
KEY COLLECTION

a great impression", leading to "experiments of wireless controlled concentrations by complete Divisional Artilleries [which then] became standard procedure from 1942 onwards till the end of the war."

On his return to England Parham found there was a 'Company-Group' theory of fragmenting artillery troops rather than concentrating massive firepower. and so had to promulgate that experience of a large concentration of artillery fire near Wavre. This culminated in a demonstration at Larkhill in front of a bevy of senior officers. The Royal Artillery war commemoration book contained this accolade: "Of all the developments that the School of Artillery sponsored during the years 1940-44, probably none had a more important effect upon the conduct of war that that of the technique of controlling large concentrations of fire by one man. The original conception of this must be ascribed almost entirely to Brigadier Parham."

What is omitted was that Parham had misjudged the mean point of impact when the demonstration took place, and the shells of one battery dropped among the VIP spectators. Amazingly none of the attendant generals were killed.

Aside from the wrangling between different services, there was the vexed question of choosing an aircraft. The Taylorcraft Plus D had seemed eminently suited, but the War Office and certain army officers for some reason favoured the much larger Stinson Vigilant, and in July 1940 an order was placed for 100. When Gen Sir Alan Brooke, later Field Marshal Lord Alanbrooke, decided AOPs would be a necessity as the war progressed, it led to the creation of a number of joint army (technical staff and equipment) and RAF (pilots, drivers and signallers) squadrons. Unlike their respective service commanders, the mixed personnel formed a close bond. They needed aircraft, and impressment into military service of 18 civilian Plus Cs provided them. The first such unit, No 651 Squadron, was formed at Old Sarum on 1 August 1941.

◆

With the Stinsons delayed and concerns mounting about their supply from the USA, an order was placed for 100 Plus Ds, purely as an interim measure. It proved a sensible move, not least when the first 13 Vigilants were damaged beyond repair while in transit. For military service the type was to be called the Auster I, the name taken from Roman mythology, in which it was an embodiment of the south wind. It was built to a basic light touring aircraft specification, with no self-sealing fuel tanks and very limited protection against enemy fire, though a small metal plate was added to the pilot's seat "for morale reasons."

Parham was able to work closely with No 651 Squadron's CO, Lt Col Charles Bazeley, whom he credited with the ultimate success of the AOP concept. Bazeley pursued it relentlessly, without fear or favour, treading on as many toes as necessary. Parham wrote, "Without Charles there would have been no Air OP in World War II". After this, Parham left to become Brigadier, Royal Artillery within Britain's First Army in July 1942. The inaugural test came later that year when No 651 Squadron accompanied the First Army's Operation 'Torch' landings in Algeria, beginning on 8 October.

On D+6 after the landings, eight Auster Is were uncrated on the Algiers civil flying club airfield at Hussein Dey. They then headed eastwards towards two towns near where elements of the 1st Parachute Brigade had landed at Bône on 12 November, and Souk-el-Arba, just inside Tunisia, on the 13th. Initially the Luftwaffe and the Vichy French air force had the upper hand, but once RAF fighter numbers were increased and air superiority achieved, the AOPs were able to perform gunnery spotting and other tasks with almost total impunity.

ABOVE: Showing a few signs of wear and tear, Auster I LB375 was with No 164 Squadron circa September 1945. It survives in airworthy condition, today in the ownership of Light Aircraft Association CEO Simon Tilling.
VIA ANDREW THOMAS

The Royal Artillery gunners had finally decided their AOP aircraft needed to be based close to the batteries, be flown by gunners, be unarmed, and fly low and slow while constantly zig-zagging. The artillery could be readied to fire before the spotter aircraft took off from a landing ground close to the front line, needing little time to observe and report back, and communications would only be between gunners, who all knew the drill and the jargon.

Parham described the early challenges flying the Auster Is: "They were as blind as a bat from the back, and it was a very tricky adventure to take on an air situation in which there were Fw 190s. But there again they were saved by the short-sortie business. You popped up, did your shooting [meaning targeting] and were down in ten minutes."

As a back-up, lookouts on the ground could warn the AOPs of approaching enemy fighter aircraft, which were reluctant to risk coming in too close to anti-aircraft artillery and machine guns. With the Auster and two-way radio, AOPs were able to control massive firepower when the situation demanded. During the Battle of Monte Cassino in the Italian campaign, a single Auster piloted by Maj Lyall, the CO of No 658 Squadron, was given 20 minutes to set up a huge barrage, called a 'William', involving 600 guns, targeting a German brigade. Smaller barrages, based on a 'Mike' (regimental) or an 'Uncle' (divisional) use of artillery, had also been developed from Parham's recommendations.

A normal 'William' involved some 216 guns, so the effect of this enormous, concentrated firepower must have seemed like the end of the world for those on the receiving end, a 'Götterdämmerung' moment. Parham himself had set up something similar, but on a far smaller scale during the retreat to Dunkirk, against the aforementioned German tank column parked up in woods near Wavre, which had been spotted possibly forming up for an attack.

> ***"It was tricky to take on a situation in which there were Fw 190s"***

Parham's report records, "The Commanding Officer [Parham] ordered a regimental concentration to be fired on the wood from 1600-1604 at intense rate. Precisely at 1600 hours the first salvo landed on the front edge of the wood among the tanks, and for the next four mins Germans poured out of the wood only to be greeted by more shells as they emerged. When the noise and smoke had finally subsided the wood was seen to be blazing furiously… and there were many dead on the ground in front of the wood."

Some time later, in his handwritten diary, he recorded, "The wood continued burning for some hours and it seemed that our shoot of some 400-500 shells in 5 minutes may have destroyed a tank unit of some sort… Possibly a tank unit refuelling from soft vehicles."

Parham's views about this type of operation helped inform Royal Artillery tactics as the war progressed. Always thinking ahead, he had written a brief paper while on the North African campaign, after the Operation 'Torch' landings, that was circulated on a restricted 'Secret' basis by the future Field Marshal Lord Alexander of Tunis to units in the First and Eighth Armies, both of which he was then commanding.

Gen Alexander wrote of how Parham was, "a practical expert in flying light aircraft", adding, "The Air OP Sqns have done invaluable work in this theatre of war since the start of the operations, and one of the Sqns have [sic] been put under command of Eighth Army for the final phase… The proposals contained in the letter attached are strongly recommended by this HQ and it is requested that they should be forwarded to the War Office for urgent consideration."

LEFT:
Jack Parham, seated second from right, looks on as Second Army commander Lt Gen Miles Dempsey briefs a Soviet delegation in the field in Normandy. Dempsey was an enthusiastic Auster user, having one as a means of battlefield transport.
WILTSHIRE AND SWINDON HISTORY CENTRE

It was in the attached memo that Parham made a direct pitch for the early adoption of helicopters for AOP work, having followed developments at Sikorsky on the R-4 model. He stated it would give, “A precise and perfect control at any speed from top speed to zero”. He also emphasised its suitability for night flying and for combined operations, along with a perfect view for the pilot.

Parham did nevertheless have criticism of the way the Royal Artillery had handled the solution to its observation needs when speaking to the Royal Artillery Historical Affairs Committee in 1965. He felt historically the RA had been too concerned with better guns and better transport for those guns, without resolving the urgent requirement for improved communication equipment. The main British artillery guns were a bit light on range, which he felt was not critical, yet the infantry they were supposedly protecting had no way, in the early days, of indicating when to stop a bombardment, or whether a barrage was falling short onto their own trenches.

By D-Day the helicopter, the eventual successor to the fixed-wing AOP, was making its first appearance in action. By chance the Royal Navy had acquired a few Sikorsky YR-4s to operate and Parham, by then in charge of the British Second Army’s artillery formations, requested some for his own AOP purposes, but to no avail. As a result, several squadrons of Austers had to be flown across the Channel from Selsey Bill. His main concern was naval gunners, who were known to be very trigger-happy, so he insisted the squadrons be escorted by Walrus amphibians in a ‘school crocodile’ formation as they crossed.

◆

Normandy saw aerial photography added to the AOPs’ portfolio, liaising with small units on the ground between their main artillery-spotting tasks. They would even take up company commanders to look at terrain where they were tasked to fight soon after, to give them as much preparation as possible for the combat ahead. As the campaign progressed, some of the spotting distances involved became too demanding for the AOPs and fighters were called in to collaborate. There was a lot of resistance, but gradually the fighter pilots learned the necessary spotting drills, being allowed to send in ‘shoot’ orders.

Parham’s military service did not end once World War Two was over. March 1946 saw him on a trip with several other senior British officers to the USA, to assess the latest advances in Sikorsky helicopter developments and the new R-5 model which showed the pace at which their research was progressing. It included a visit to the Field Artillery School at Fort Sill, Oklahoma to have a look at some of the current US artillery pieces and give a series of lectures, and invitations to Fort Bragg, North Carolina, the home of the US Army’s airborne forces.

Parham retired in 1949 after a final posting to Edinburgh, where he also learned to sail. He finally decided the cost of flying would be too high to afford as a retired officer, so instead turned his hand — and his design skills — to sailing. This became easier after his retirement to Suffolk, where he kept a small catamaran, the *Belinda Ann* he had part-built himself, on the River Orwell. His wartime experience made him turn his hand to co-authoring with E. M. G. Belfield the memoir *Unarmed into Battle* about AOP operations, supported by the AOP Officers’ Association, which was published in 1956.

He also took to co-authoring articles and books on sailing with Austin Farrar, with whom he also developed a special wing-mast una-rig for ‘C’ Class catamarans. Parham’s basic premise was that sails and wings were essentially the same thing, so he applied his knowledge of aviation aerodynamics to his new hobby. He focused on the twisting effect of wind on sails, where the top of the sail could have 40° less incidence than at the bottom. Various iterations later, a Parham/Farrar rig was used on the *Lady Helmsman* catamaran that won the Little America’s Cup for three years, 1966-68.

In a handwritten note from 1966, Parham summed up his work on the development of the theory and practice of deploying AOPs in the field, and his intense, but brief, pre-war love affair with his Aeronca C2, G-ABHE. He concluded, “In the years 1941/42/43 I was in a position to have some influence on the Air OP project and, because I had (thanks to G-ABHE) built up a store of practical experience, I was able to talk with some authority and use the Air OP with imagination. Out of the success of the Air OP came the restoration to the Army, in the shape of the Army Air Corps, of its own aviation which it lost in April 1918… I never cease to marvel at the good fortune which made my life coincide with the birth of aviation.”

The author thanks the Army Flying Museum at Middle Wallop, especially archivist Kyle Thomason, and the Wiltshire and Swindon History Centre in Chippenham.

Patients and staff at the RFC Hospital Eaton Square, opened in September 1917 with beds for 30 patients. ALL VIA PETER DYE

STRESS TEST

For Britain's air arms of the First World War, the question of how best to mitigate against the effects of combat stress — and its potential impact on operations — was a vexed one. But the early efforts to tackle the causes and effects demonstrated a compassionate approach that, for the period, may surprise

WORDS: PETER DYE

On an aerodrome in France are the SE5as of No 40 Squadron, on which unit served William MacLanachan, who wrote of how the conditions experienced by those on the front line were so seldom properly portrayed. KEY COLLECTION

LEFT: One of the wards at the RFC Hospital Bryanston Square in London's Marylebone area, which was able to cater for 20 patients in total.

The conventional narrative about combat stress in the British air services during World War One veers between dramatic opposites. At one extreme we have the superhero ace of films and popular fiction, defeating all-comers while flying high above the destruction below; and at the other we have the barely trained, novice pilot, easy meat for enemy fighters and destined to survive for a few weeks before meeting a fiery death.

Ninety years ago, 'McScotch' — actually William MacLanachan, who flew with Mick Mannock on No 40 Squadron — wrote, "A deluge of blood and thunder literature has enveloped the fighter pilots of the RFC and RAF until the real fighters have been almost entirely obscured. The conditions under which we worked have been grotesquely misrepresented and the general atmosphere so luridly painted that experienced fighters must have been given the impression that they could not possibly have taken part in the real he-man war of fiction. On the other hand, the bald official records do not do justice to those who did the actual fighting."

One might imagine, given the British Army's unsympathetic handling of 'shell shock', that the Royal Flying Corps would have adopted a similar approach to stress-related illness. In fact, its senior leaders showed considerable sympathy towards those suffering from what would now be described as post-traumatic stress disorder, even if treatment was characterised by confusion. Different conditions were conflated while a variety of names were employed to describe similar symptoms. Contemporary documents employ terms such as 'flying stress', 'staleness', 'flying sickness (debility)', 'aero-neurosis' and 'aviator's neurasthenia' to cover depression, fatigue, mental lassitude, apprehension, faintness and irritability. For this article, I employ the term 'combat stress' to describe the varied mental health problems faced by airmen in World War One.

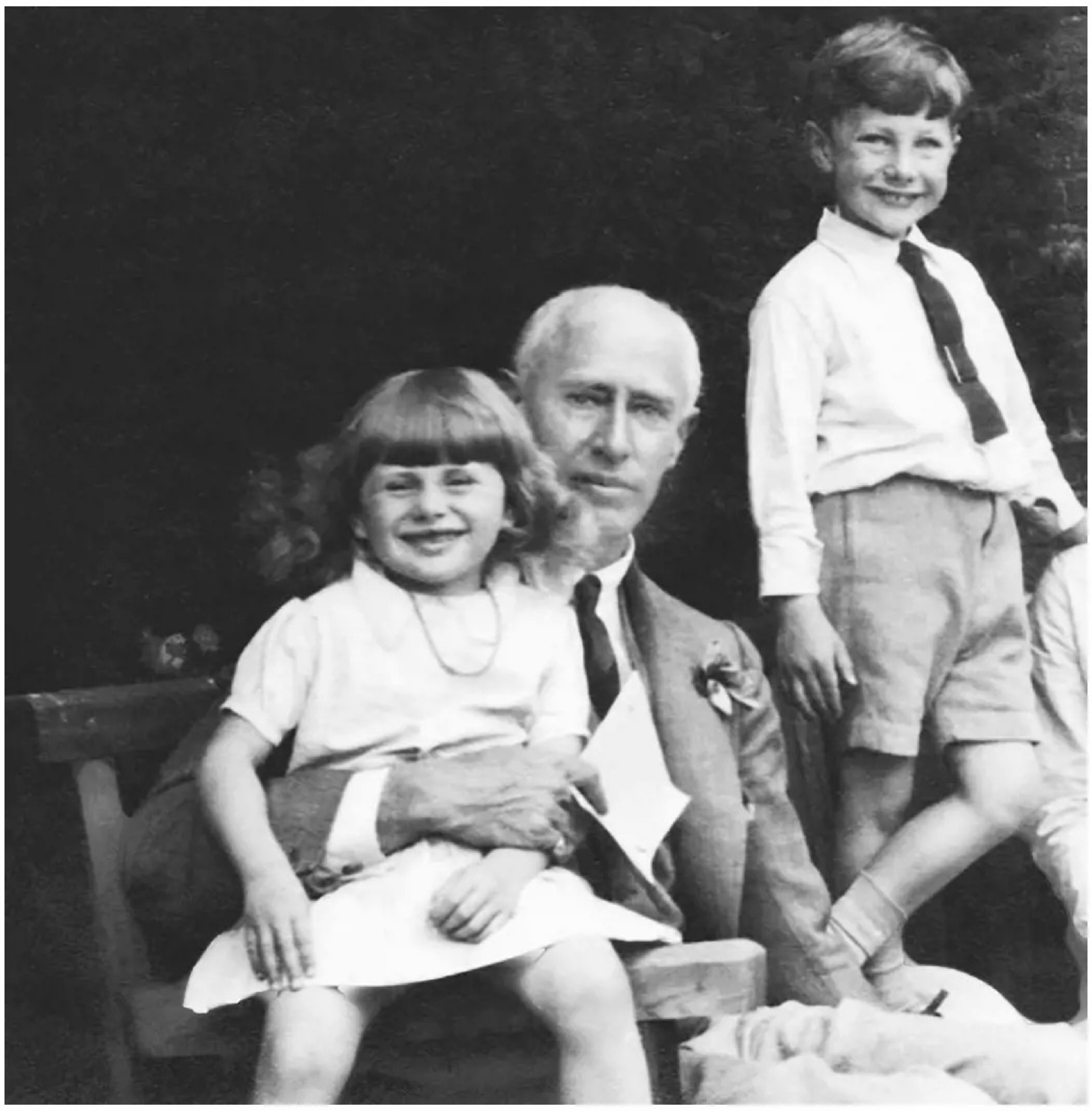
Pilot fatigue had been identified as an issue well before the war started. The RFC recognised not only that military flying took a physical toll but also that accidents had a cumulative, and debilitating, effect. Robert Brooke-Popham reported he had had to significantly restrict the hours flown on the last day of the army's 1913 manoeuvres because his pilots were tired out. The first months of fighting on the Western Front confirmed pilot fatigue was a serious issue, paving the way for the Army Council to agree the RFC could manage its officers without reference to GHQ. So, although squadrons were expected to fly every day, when the weather was suitable, individuals were not.

Trenchard was adamant existing squadrons should be kept at full establishment, ensuring there were always aircrew to carry out the flying task without overloading their colleagues. He also aimed to rotate pilots and observers between the Western Front and England on a regular basis. This allowed for recent operational experience to be fed into the training system, the career development of officers with command potential and (hopefully) avoided excessive fatigue. No formal tour lengths were set, but in practice they averaged around six months.

> ***"The RFC's leaders showed considerable sympathy"***

In addition, aircrew serving on the Western Front also enjoyed a generous leave policy, as an observer with No 15 Squadron remembered: "I had noticed that we, pilots and observers, had always been given our leave regularly and frequently — far more regularly and frequently than anyone else in France. On analysis, I think it is proved that the standing rule, 'flying personnel got their leave every three or (at most) four months whether or not a battle was in progress', was a wise rule, as well as a considerate one."

LEFT: Before the arrival of James Birley as Trenchard's medical advisor in October 1916, there were few medical officers attached to the RFC. Their main duties focused on hygiene, as with this unknown RAMC officer inspecting the tented accommodation at the RFC's Concentration Camp at Netheravon during 1914.



RIGHT: Maj (later Lt Col) James Birley RAMC, Trenchard's medical advisor in France from 1916-18, with his children. Birley's early death in 1934 robbed the RAF of an important and influential voice in the treatment of combat stress.

It took some time for the special needs of aviators to be recognised. Medical provision in the RFC was limited, if not rudimentary. Individual squadrons were only allocated a medical orderly. The latter's role was largely focused on sanitation — some were even unable to fix a splint. The sick, or those with more serious injuries than cuts and bruises, were taken by car or tender to hospital. In the case of an injured or wounded aviator, the orderly was able to render first aid, but was not allowed to administer morphia.

The Royal Army Medical Corps was initially opposed to the idea that there were specific problems unique to flying personnel. As a result, there was very little scientific effort on the physical effects of flying or the need for special screening. The RFC's first cases of combat stress — described as 'neurasthenia' — were identified in 1915, but it was not until the latter stages of the Somme that serious concerns emerged about the number of nervous breakdowns. The appointment of Capt (later Lt Col) James Birley as Trenchard's senior medical advisor in October 1916 marked a radical change in the RFC's approach. Following Birley's arrival, medical officers were appointed to each brigade and ultimately to each wing.

It was also through Birley's efforts that a specialist ward was established in August 1917, at 24 General Hospital in Étaples, to treat sick airmen. Birley, a prominent neurologist in civilian life, and his colleague and close friend, Capt Dudley Corbett, came to the view that every aviator who stayed in action long enough would become a psychological casualty. They believed the best treatment for combat stress was sympathetic therapy and rest away from the front line, helping the patient acknowledge the repressed emotions that were the source of their anxiety and physical symptoms.

BELOW: Capt (later Maj) Dudley Corbett RAMC, a close colleague of Birley who managed the RFC's specialist ward at 24 General Hospital, Étaples.

❖

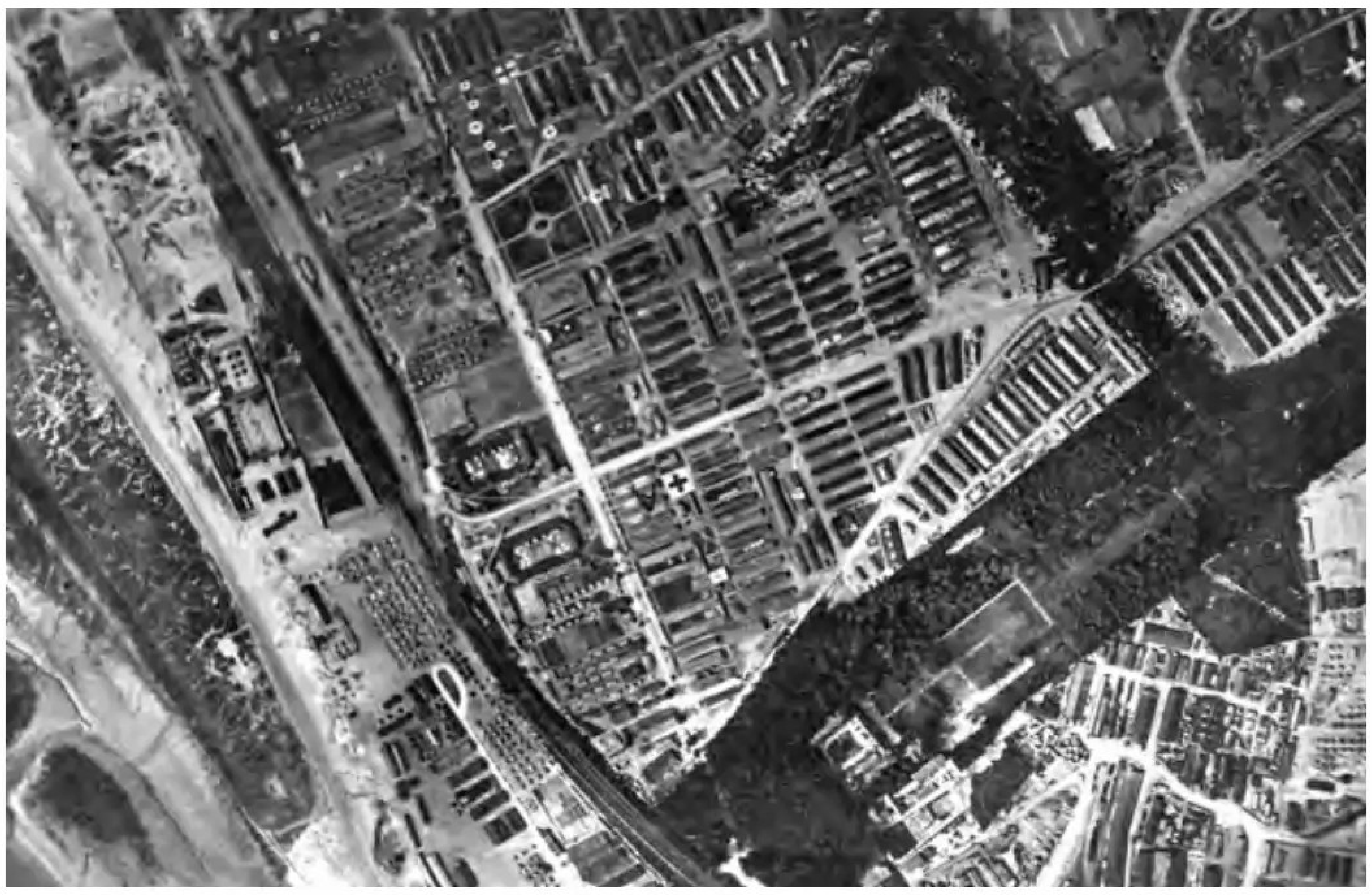
Birley instigated what would become known as the 'Care of the Flyer' programme. His growing number of staff, working alongside squadron commanders, were responsible not only for welfare (including off-duty activities) but also for ensuring individuals were fit to fly, rather than waiting for them to self-report. Birley's influence extended beyond the RFC, notably in the medical arrangements for the United States Air Service and the creation of the flight surgeon role. The Americans concluded a specialist doctor should be allocated to each aviation unit, responsible for ensuring an individual was fit to fly — a policy that would eventually be followed by all air services.

When the RAF was formed on 1 April 1918, RFC doctors went to all the ex-RNAS units in France to check on their health. Philip Bartlett, a flight commander with No 205 Squadron flying DH4 day bombers recalled, "The RFC are sending their medical officers round to former RNAS squadrons, and they fastened on me as having been out too long and decided I must return home for a rest and then a spell of Home Establishment. I dare say they are right, though I hate the idea of saying goodbye to 205. These last three weeks have certainly been strenuous."

After being examined by Dudley Corbett at 24 General Hospital, Bartlett and two other officers were diagnosed as suffering from combat stress and sent back to England.

Harold Balfour was another airman 'caught' by Birley's staff: "For some weeks before the end of March, I had felt the same old trouble coming back; unable to sleep at night, a general desire to shirk battle and a complete inability to eat a decent meal. One day in the Mess, I half-fainted. The Wing doctor happened to be lunching with us that day and insisted on examining me… A week later, I was back in England and given some weeks sick leave."

Corbett's surviving reports on Bartlett and Balfour suggest



LEFT: A specialist ward for RFC casualties was established by James Birley at 24 General Hospital, Étaples — marked here with a 'A' near the cross in the centre of the picture — in August 1917.

both pilots played down their disabilities. Returning to England in company with the badly wounded, and embarrassed by a lack of visible injuries, they were, in fact, both close to a breakdown.

It was generally accepted that a fighting pilot's first two months of active service represented the critical period in which they were most vulnerable and least effective. Considerable effort was taken to identify the weakest individuals as soon as possible, before they became combat casualties. By 1918, squadron commanders were required to complete a report on every new pilot after just three weeks. 2nd Lts Robert Aitken and Victor Hatton joined No 5 Squadron on the RE8 in February 1918. Hatton crashed on five occasions from the same cause, pancaking, while Aitken crashed on all three of his practice flights. The two teenagers — Aitken was still 18 and Hatton had just turned 19 — were sent back to England for further instruction after less than a month in France.

> ***"Birley instigated what became known as the 'Care of the Flyer' programme"***

Having survived their first months of war flying, an individual was regarded as being at the zenith of their ability. They were less vulnerable, more assured, and more effective. There was no set length to this period. It depended on a range of factors, but what was certain was that it would end. It largely fell to the squadron commander to determine when one of his officers was approaching this point. To provide some relief from stress, and to vary their routine, squadron commanders were encouraged to organise social events, inviting dinner guests from local army formations, organising concert parties, and laying on transport for trips to the nearest town. Birley was all in favour of such arrangements. His maxim was, "Keep their tails up on the ground, and they'll look after themselves in the air."

Trenchard knew he was asking a lot of his squadron commanders and that he was not well-placed to judge their performance. He wrote later, "It must be remembered that commanding an air force from the ground is much harder to command fairly and justly than commanding armies on the ground. A good general realises the difficulties and tries to picture what is in the mind of the man who does the work whenever they make their criticism, and to keep a calm and balanced head and fair judgement, but it is much harder for the air marshal to realise all the difficulties and to be fair and keep a balanced judgement."

We don't know exactly how many airmen suffered from stress-related illness on the Western Front. According to Birley, 24 General Hospital treated close to 2,000 pilots and observers between August 1917 and November 1918. Around 40 per cent were diagnosed as suffering from combat stress, equivalent to around 50 cases each month. Most of the patients that came under Birley's care recovered rapidly, such as Lt John Coleman, an observer with No 27 Squadron flying DH4 day-bombers, who arrived in February 1918 suffering from the effects of high flying. His extremities were cold and blue and even on a warm day his peripheral circulation was sluggish. After 10 days he was well enough to be recommended for three weeks' leave in England before returning to his squadron.

Some patients had simply done too much flying. They included Capt John Andrews DSO MC of No 70 Squadron on the Sopwith Camel. Just 21 years old, Andrews had already completed 900 hours' war flying and amassed 12 aerial victories. The intense fighting after the German spring offensive proved too much and Birley recommended Andrews be given three weeks' rest in England. He returned to France in May 1918 as an acting major in command of No 209 Squadron, again flying Camels. Andrews stayed in the RAF post-war, retiring as an air vice-marshal in 1945.

Not everyone was sent back to England. One such was the 19-year-old 2nd Lt William Whale, who

BELOW: Capt (later AVM) John Andrews CB DSO MC and Bar had 12 aerial victories. Andrews was admitted to 24 General Hospital in March 1918 suffering from combat stress. He made a full recovery and returned to operations that May.

ABOVE: Maj Harold Balfour MC and Bar notched up nine aerial victories. before his March 1918 admission to 24 General Hospital as another combat stress case. The future peer returned to the UK in order to command a training school.

had repeatedly crashed during training and had a further two crashes immediately after joining the RE8-equipped No 5 Squadron in September 1918. It was agreed that Whale could return to his squadron as an observer.

Beyond extended leave in England, there was very little else the medical authorities could offer in the way of further treatment. In some cases this was enough, but for others the symptoms soon returned. Capt Frank 'Pongo' Billinge, a flight commander with No 56 Squadron on the SE5a, reported how he became sick and giddy in the air, particularly when flying above 12,000ft. His condition improved and he was given three weeks' leave in England before joining No 83 Squadron to fly the FE2b, but two months later he was again admitted to hospital. After further rest in England, Billinge returned to France, this time to fly with No 13 Squadron on the RE8. He had to be hospitalised for a third time after just two weeks. Billinge, who had completed more than 800 hours' war flying and was credited with five aerial victories, was awarded the DFC in August 1918 but never flew operationally again.

An analysis of the casualty cards held by the RAF Museum has shown admissions to hospital for combat stress were relatively rare until 1916, but by 1918 they were running at about 60 cases a month. This tallies with Birley's recollection, but it has led some to argue the RAF would have run out of aircrew before the end of the year. Can this be correct?

It is certainly true that in 1918 admissions for combat stress were far higher than the previous year. For example, No 56 Squadron reported just two cases in 1917, but 10 in 1918, while No 9 Squadron noted one in 1917 and seven in 1918. However, this is likely to have been the result of under-reporting in 1916 and 1917 and Birley's proactive efforts, from 1918 onwards, to identify individuals at risk.

Did the increasing number of aircrew withdrawn for reasons of combat stress impact on air operations in 1918? The evidence suggests not. The first point to make is that the number of combat stress cases, even in 1918, was a relatively small proportion of total combat casualties. Moreover, if identified soon enough, most individuals returned to flying operations. As 1918 progressed, the proportion of British aircraft lost to air combat steadily fell, even though the number of German fighter units (Jasta) had more than doubled since 1916. The number of British corps machines — the key to accurate, timely artillery fire — lost to air combat also fell. These are only indicators, but they certainly suggest the RAF's approach to managing combat stress did not impede air operations and may well have increased combat power.

Although the number of individuals diagnosed with combat stress was a relatively small proportion of the total casualties suffered by the British air services on the Western Front, all aviators experienced some form of mental stress. Approximately 13,000 aircrew served in France during 1918. If we accept that there were at least 600 cases of combat stress, around five per cent became casualties from this one cause.

> ***"Anxiety and fear were the inevitable companions of every flight"***

Of course, we do not know how many individuals hid their symptoms rather than acknowledge the strain they were under. Anxiety and fear were the inevitable companions of every flight. It was also a very personal struggle, as Birley observed: "A flying officer relied essentially on his own skill, his own courage, his own resolution, and his own sense of honour and of duty. He lacked, and most certainly missed, the inspiration born of responsibility to his men and that intimate comradeship in danger which for the infantry officer served as sources of support and encouragement."

Birley returned to civilian life after the war but remained as the RAF's consulting physician until his death in 1934, aged just 49. His colleague, Dudley Corbett, had died from influenza in December 1918, aged 36. Their shared experience and sympathetic approach might otherwise have helped Bomber Command manage the problem of combat stress in World War Two more effectively and with greater compassion.

MEDICAL OFFICERS ATTACHED TO RFC/RAF

Year	1914	1915	1916	1917	1918
Attached medical officers	1	1	10	15	37

COMBAT STRESS CASES ON WESTERN FRONT 1915-18

Year	1915	1916	1917	1918
Cases — all Western Front	5	21	46	664
Cases — No 56 Squadron	-	-	2	10
Cases — No 9 Squadron	-	-	1	7

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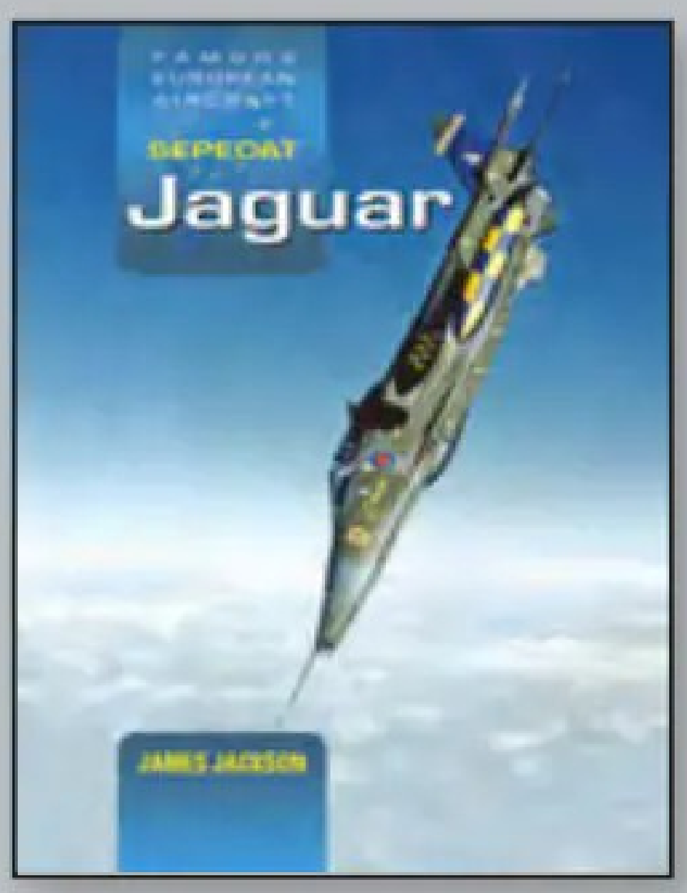
Wings of Argentina
Argentina's Aircraft Industry Since 1927
Santiago Rivas

The Argentinian Aircraft Factory, Fabrica Argentina de Aviones SA (FAdeA), Argentina's main aircraft manufacturer, was founded in 1927. Initially, it produced aircraft built under licence from companies such as Avro but it is best known for making the first jet fighter aircraft in Latin America: the Pulqui I (1947) and the Pulqui II (1950) under the direction of engineers Emile Dewoitine and Kurt Tank respectively. The post World War Two era was a particularly interesting one at the FAdeA with creative and innovative designers such as Reimar Horten being involved with the business.

This book is a history of the company and its aircraft from the 1920s to the present day. It covers all the aircraft produced by the company, both those built under licence and original designs. It also examines the many projects and prototypes which were developed over the years. For all those with an interest in some of the less well-known aspects of aviation history, this book will be a revelation.

ISBN 9781902109671: Hardback,297mm x 210mm, 384 pages, over 300 images £34.95

Sepecat Jaguar
A Development and Operational History
James Jackson



The Jaguar was designed to meet the requirements of L'Armée de l'Air and the Royal Air Force for a light tactical fighter and a supersonic two-seat training aircraft. First flown in September 1968, Jaguars were also acquired by the air forces of Ecuador, Oman and Nigeria and licence-built in India.

It offered a potent mix of high speed at low altitude, excellent navigational and weapons accuracy and a diverse payload of air-to-ground ordnance including tactical nuclear weapons, laser-guided bombs and missiles. While the Jaguars of the RAF helped to deter the Warsaw Pact during the 1970s and 1980s, L'Armée de l'Air used it in combat in Mauritania and Chad and both air forces participated in the international coalition following Iraq's invasion of Kuwait in 1990. Later, it saw service in the skies over Bosnia-Herzegovina, Kosovo and Sri Lanka and was also in combat in places as diverse as the Andes and Kashmir in the Himalayas.

Drawing on archival research, *Sepecat Jaguar* provides a complete history of the aircraft, its design and technical development and service in peacetime and war. Illustrated throughout with photographs, drawings and specially commissioned artwork.

ISBN 9781800353299, Hardback, 280mm x 216mm, 336 pages, approximately 400 images £39.95

Wrecks & Relics **On Guard**
Britain's Military 'Gate Guardians' and Air Cadet Airframes Since 1940
Ken Ellis

This is a celebration of the gate guardians that for decades were a feature at the entrance to many RAF, Fleet Air Arm and Army bases. Prominently located and usually kept in good condition, these retired aircraft allowed passers-by to see up close examples of historic and significant aircraft types, such as the Hurricanes and Spitfires which won the Battle of Britain. As time moved on, other retired aircraft took their places on these plinths, early military jets and helicopters among them.

The book traces gate guardians on a location-by-location basis with full histories of significant examples and details all aircraft that have been displayed at military establishments across Great Britain and its Crown Territories. As well as the fascinating aircraft, the book provides background on many long-forgotten military bases. In addition, for the first time the histories and fates of the hundreds of aircraft used for instruction and display by Air Cadet squadrons since the early days of World War Two are detailed.

On Guard is a wonderfully nostalgic journey back in time, copiously illustrated throughout and including colour images taken over a period of six decades.

ISBN 9781902109671: hardback, 297mm x 210mm, 296 pages, 96 colour and over 200 black and white photos £19.95

TSR2
Revised and expanded 60th anniversary edition
Tim McLelland, with additional chapters by
Tony Buttler, Ken Ellis and Clive Richards

A revised and enhanced third edition of this comprehensive, accurate and honest account of the TSR2 story, tracing the project's development from its Cold War origins in the 1950s to final cancellation in 1965. The book examines the project in detail, eliminating the many myths and misconceptions that have surrounded this aircraft for six decades. Much misinformation has been published on the TSR2, which this book seeks to dismiss, presenting the reader with a thorough and realistic overview of the entire project by dealing with the facts and not the speculation and fantasy which has plagued the history of this aircraft for so long.

In addition to Tim McLelland's original work, new chapters have been added to this third edition. Tony Buttler covers the design problems faced by the TSR2, Ken Ellis accesses the ways in which the TSR2 influenced future aircraft development despite its termination and Clive Richards examines the pre-history of requirement GOR339 which led to the TSR2.

ISBN 9781800353312, Hardback, 79mm x 216mm, 216 pages,approximately 150 images £27.95

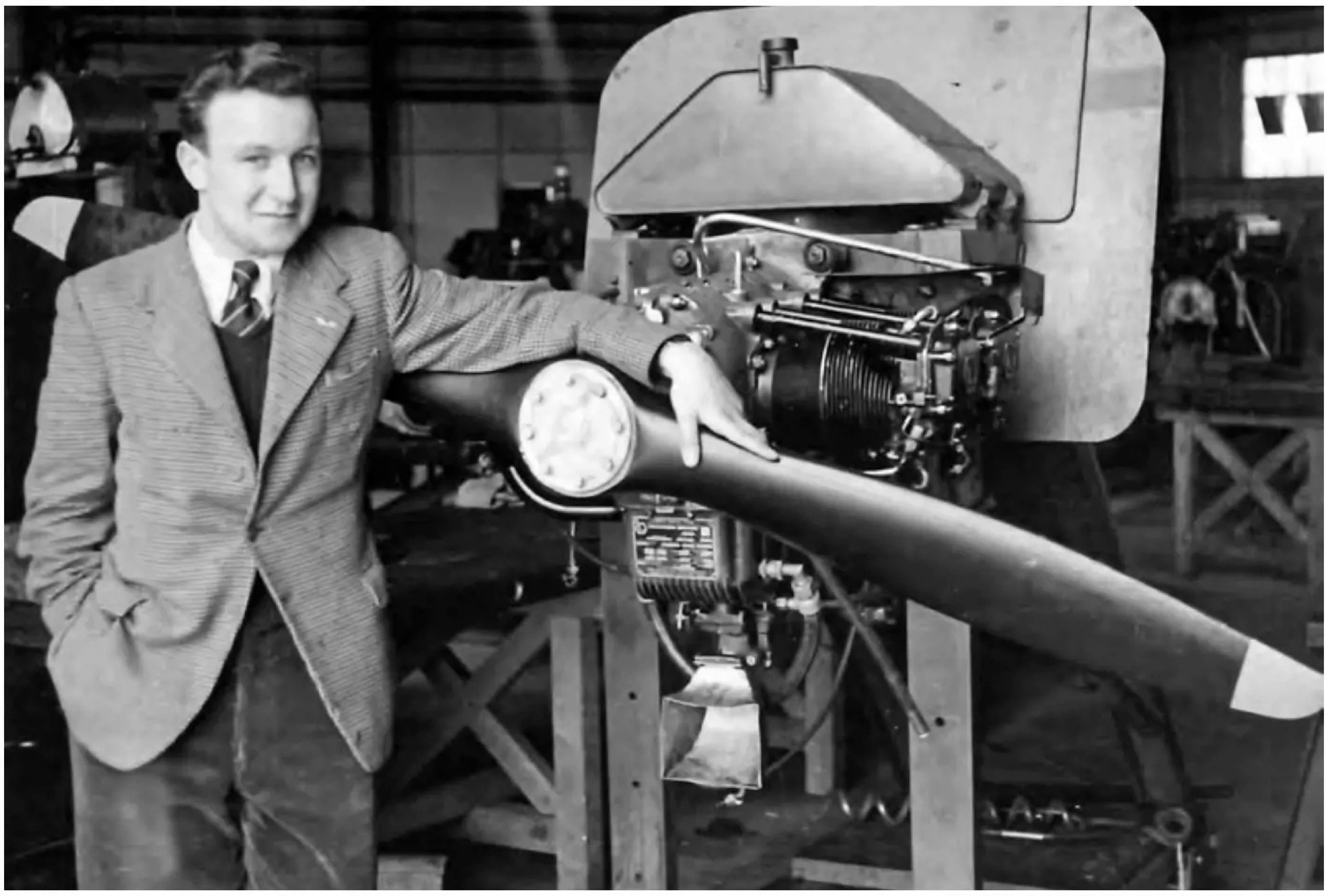
AEROPLANE *met...*

DESMOND PENROSE

A TRIBUTE

The great test and display pilot, a direct link back to the days of de Havilland and a tremendous supporter of vintage aviation, has passed away — but leaves a fine legacy. We revisit our 2020 interview with Desmond, and delve into his archives to discover more about his very full life

WORDS: BEN DUNNELL



ABOVE: The young Loughborough College student with one of its test engines. LOUGHBOROUGH UNIVERSITY ARCHIVE

Reading through the logbooks of Desmond Penrose, who died on 13 May aged 95, one realises how his passing marks the end of an era. Working as a development test pilot for de Havilland and Hawker Siddeley — though it was always de Havilland to Desmond — he flew alongside the likes of John Cunningham, Pat Fillingham, Peter Buggé, Ron Clear, George Errington and Chris Capper, great names all. None of their number carried on as an active aviator for so long. It was only in the summer of 2018 that he hung up his helmet and goggles, though his deep interest in matters aeronautical never diminished.

That became crystal-clear when, during late 2020, I went to see Desmond for our '*Aeroplane* meets…' series. Did he miss flying, I wondered? "I don't miss it by day, but I dream about it. I always have rather technical dreams. I had one about two or three months ago about an aerodynamic problem, which I solved in my dream. When I woke up I thought, 'No, that's not right'". How many nonagenarians would be able to come up with a story like that?

Accompanied by Shuttleworth pilot Scott Butler, the tales abounded over lunch that day, the results appearing in our December 2020 edition. Now it seems like the most suitable tribute to revisit some of our interview, but also to use another splendid resource. Before he died he bequeathed his papers and logbooks to Loughborough University, his alma mater, of which he was tremendously supportive. Thanks to its archive, it's possible to get an even fuller sense of Desmond's career, one that spanned more than seven decades. And we started by turning the clock even further back.

◆

"When did I know I wanted to be a test pilot? 1943. I used to get sixpence a week pocket money, I was away at school in Somerset, and if I had a shilling I could go to a newsagent and get out-of-date copies of *Flight* or *The Aeroplane* — sometimes four, sometimes six, depending on how generous he was. I read that the Empire Test Pilots' School had been set up at Cranfield. Having seen that, I then turned later that day to my closest friend, Peter, and said, 'I'm going to be a test pilot'. I was all of 13. He said, 'Your maths aren't good enough', and he was right. He was bright, I wasn't. I had to work hard."

Desmond did just that, and in 1946 went to Loughborough College — now Loughborough University — to read aeronautical engineering. There, with Nottingham University Air Squadron at Newton, he learned to fly, going solo in a Tiger Moth on 14 April 1948.

"I don't think I was a particularly good pupil, but I had a very good instructor, Charlie Dalziel, who had been a bomber pilot in the Second World War. He was about 15 stone and played rugby. I was having difficulty with my slow rolls, and he would undo the stick in the front, get up, turn round and — this was before the days of bonedomes — hit me with it. It hurt! So, I waited. I got my slow roll slightly wrong, and he stood up. I lifted the nose up and rolled it. He never did it again…"

Having won the Jonathan Cash Trophy for best cadet in 1947-48, Desmond graduated during 1951 — the same year as he was awarded a permanent RAF commission.

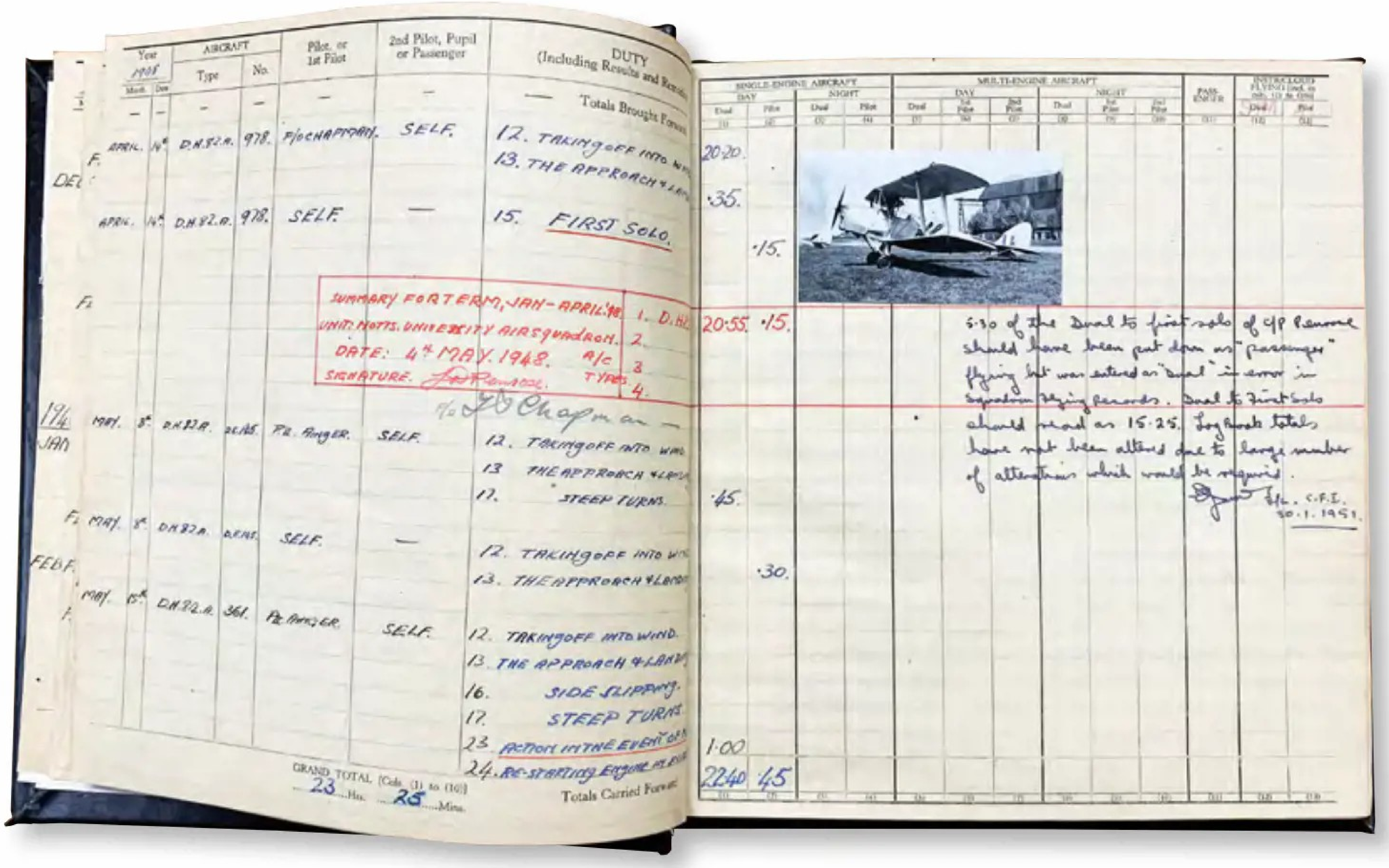
"I was more advanced than my fellow junior officers because I'd met so many different nationalities: Indian, Thai (a prince), Norwegian, Portuguese, a Palestinian of Austrian extraction. When I came away from Loughborough I could swear in six languages."

A short course on Harvards with No 7 Flying Training School at Cottesmore, for students who had been on a UAS, presaged Desmond being awarded his wings. Then came jet conversion on the Meteor T7 with the Full Sutton-based No 207 Advanced Flying School, further training with No 226 Operational Conversion Unit at Stradishall, and in November 1952 a maiden posting to No 208 Squadron at Abu Sueir, Egypt, on the fighter-reconnaissance Meteor FR9. Flying fast at low level caused some structural problems.

> **"When I left Loughborough I could swear in six languages"**

"One Meteor lost its tailplane in the middle of an exercise called Exercise 'Sunray'. Some Lincolns were sent over from Cyprus, and we did an intercept on them. The defending fighters were Venoms. One of the Venoms got on the tail of Pete Greensmith's Meteor at, I don't know, 35,000ft, and Pete pulled through. As he pulled through, the tail came off. The Venom pilot didn't see anybody eject, and we spent three days trying to find the wreckage in the Sinai desert. There was a committee of adjustment,

OPPOSITE PAGE: Towards the end of his flying career, during the summer of 2018 Desmond flew the official RAF 100 baton in Stuart McKay's Tiger Moth G-AZZZ. DARREN HARBAR



Year 1948 Month	Date	AIRCRAFT Type	No.	Pilot, or 1st Pilot	2nd Pilot, Pupil or Passenger	DUTY (Including Results and Remarks)	Single-Engine Day Dual (1)	Single-Engine Day Pilot (2)
—	—	—	—	—	—	— Totals Brought Forward		
APRIL.	14th	D.H.82.A.	978.	F/O CHAPMAN.	SELF.	12. TAKINGOFF INTO W 13. THE APPROACH & LA	20.20. .35.	
APRIL.	14th	D.H.82.A.	978.	SELF.	—	15. FIRST SOLO.		.15.
						SUMMARY FOR TERM, JAN–APRIL '48. UNIT: NOTTS. UNIVERSITY AIR SQUADRON. DATE: 4th MAY. 1948. SIGNATURE. A/c TYPES 1. D.H. 2. 3. 4.	20.55.	.15.
						F/O J.D. Chapman		
MAY.	8th	D.H.82A.	[illegible]	F/L. RINGER.	SELF.	12. TAKINGOFF INTO WIND 13 THE APPROACH & LANDI 17. STEEP TURNS.	.45.	
MAY.	8th	D.H.82A.	[illegible]	SELF.	—	12. TAKINGOFF INTO W 13. THE APPROACH & LAND		.30.
MAY.	15th	D.H.82.A.	361.	F/L RINGER.	SELF.	12. TAKINGOFF INTO WIND. 13. THE APPROACH & LANDI 16. SIDE SLIPPING. 17. STEEP TURNS. 23. ACTION IN THE EVENT OF 24. RE-STARTING ENGINE	1.00	
						Totals Carried Forward	22.40	.45

GRAND TOTAL (Cols. (1) to (10)) 23 Hrs. 25 Mins.

5.30 of the Dual to first solo of C/P Penrose should have been put down as "passenger" flying but was entered as "Dual" in error in Squadron flying records. Dual to First Solo should read as 15.25. Log Book totals have not been altered due to large number of alterations which would be required.
S/L. C.F.I.
30.1.1951.

ABOVE: Desmond's first solo in April 1948 was prominently noted in his logbooks, which are now in the hands of Loughborough University and accessible to researchers.
LOUGHBOROUGH UNIVERSITY ARCHIVE

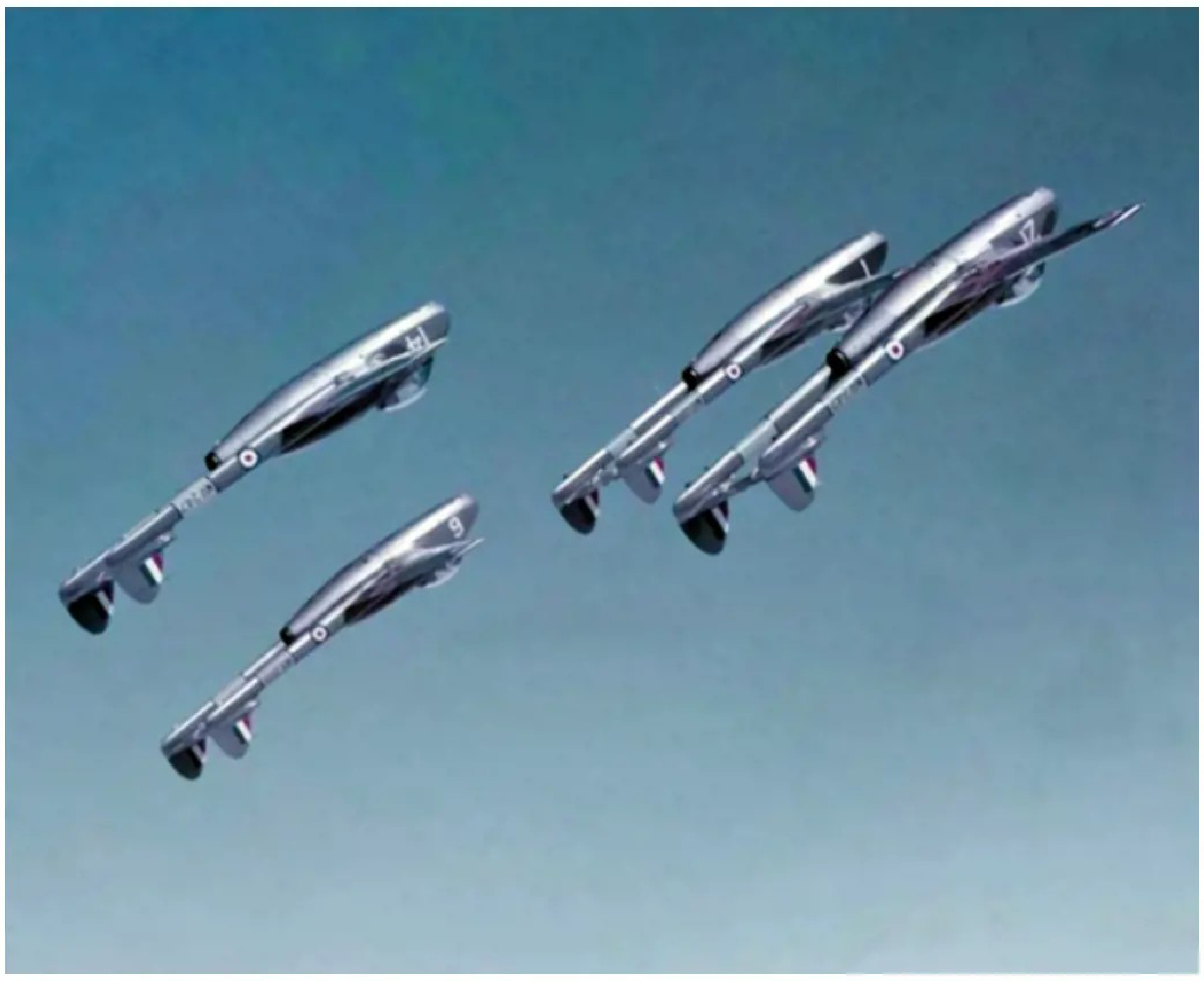
and Pete's kit was auctioned — the money was going to be sent to his family. Vaguely pornographic postcards were thrown away.

"The funeral, a proper funeral with a gun carriage but with sandbags in the coffin, was organised by an RAF Regiment officer. Everything was set up. On the morning, who walked in through the gate but Pete Greensmith? The first chap who met him was this RAF Regiment officer who said, 'You bastard! You might have waited another day!'"

From June 1955 Desmond trained as an instructor with the Central Flying School, being assigned thereafter to the RAF College at Cranwell. His first steps in display flying came when he formed a four-aircraft Vampire FB9 team for 1956. Always highly rated in senior officers' reports, the road to his desired test-flying job opened out in front of him. February 1958 saw him starting No 17 Course at the Empire Test Pilots' School, receiving an 'above average' assessment for his final Preview on the Sea Hawk. That December, staying at Farnborough, a test pilot's job with the Royal Aircraft Establishment beckoned.

"I did a lot of work on very low-frequency navigation systems with the Comet 2E, and some of the first fly-by-wire development with the Avro 707C. That was a very interesting aeroplane to fly. It was not difficult to take off, not difficult to handle, but you had to make certain that you *put* it on the runway — not to over-rotate, because if you did, it would drop a wing."

Those were just two of the myriad types he experienced at the RAE. While he was there, a trip in a Varsity to the Hawker factory airfield at Dunsfold in October 1960 brought a unique opportunity: a flight in Hurricane IIc PZ865, then owned by the company. Bill Bedford gave him a briefing, after which he enjoyed a session of aerobatics and circuits. Desmond's enthusiasm for flying historic aeroplanes only grew from there, not least after an approach from de Havilland chief test pilot John Cunningham changed the course of his life again.



RIGHT: Flying as number four in the RAF College's 1956 aerobatic team of Vampire FB9s.
CROWN COPYRIGHT

> **"I was blunt in my description of what I thought of Hawker Siddeley"**

"I was coming to the end of my tour when John Cunningham asked me whether I'd resign my commission and join him at Hatfield. I had not thought about it. I'd just thought I'd stay in the air force until I reached a certain rank. It took me two months to make my mind up, which rather strained my relationship with John. But I joined de Havilland in 1961, and I never looked back."

As project pilot on the Sea Vixen FAW2, Desmond used to report regularly to the design and engineering team, represented by R. E. Bishop, the man behind the Mosquito and the Comet.

"I used to see him regularly for a Monday morning meeting, round about 11 o'clock with coffee and biscuits, to tell him how the Sea Vixen programme was going. On one occasion he asked me to give his son Dick a flight. I got him airborne in a Heron and let him handle the controls. It happened to be on the day that we ceased to be de Havilland and became Hawker Siddeley, and Dick asked me what I thought about it. Well, because he was a 16-year-old I didn't use any expletives, but I was fairly blunt in my description of what I thought about Hawker Siddeley. What I didn't know was that we'd got an open transmitter on the company frequency, and everything went out to all of the company airfields. My career went on a plateau.

"With the Sea Vixen, Hawker Siddeley said they would not put forward the funds for a spin trial. I spoke to R. E. Bishop, and he said they couldn't put forward the £20,000 we needed for telemetry. Well, I couldn't have a fighter going into service without doing a spin trial. I told [flight test observer] Robin Potts one day that I was going to fly it solo. He said, 'Oh, I'll come with you', but I said no, I wanted just to go and do a handling test. What I had done was to leave an envelope in my desk, in which I'd laid out the spinning programme. There were going to be eight spins: normal entry, accelerated entry, steep turn entry and unusual position entry, all left and right, making eight altogether. I explained why I was doing it, just in case I didn't come back. It was a great anti-climax. I came back, I picked up the envelope and burnt it at home that night. It was unauthorised — I'd put my career on the line."

de Havilland's Firestreak and Red Top missile test programmes put him in the cockpit of two pre-production development batch Lightnings.

"It was limited to Mach 1.7. I took it up to 1.98, and at 1.98 it was starting to go sideways, because it had the small fin. I throttled back very, very gently. If I hadn't done it gently it would have departed. I spoke to [English Electric chief test pilot] 'Bee' Beamont the following day, and he said, 'You realise you were running out of directional control?'"

Desmond had the highest regard for his boss, John Cunningham.

"What I didn't realise was that John was projecting me forward. He was giving me responsibility for one job to then take me on to another. My skill as a test pilot was improved, and he was a joy to fly with. He never gave an order — it was always a request. But he was a very firm individual. I had a call from him one day to say ETPS were coming for lunch and he would like me to help host them. I said I couldn't do that, as there was an aeroplane coming up for me to fly. There was a pause, and he said, 'Is this a clear line?' I said yes. There was a click. I ended up having lunch."

ABOVE: Speed recorder calibration work with Sea Vixen FAW2 XN684 during 1962.
VIA TONY BUTTLER

Hatfield gradually had less to do on the military side, so the Trident and HS125 took more of Desmond's time. "I used to loop and roll the 125", he said, "but I will never admit to rolling the Trident". One was far more successful than the other.

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"Commercially the 125 was superb, and yet the publicity it was given against the Trident was minimal. The money from the 125 actually brought in the resource to continue the Trident. In 1967 I did two three-month tours, one of South America, one of the Far East, in the 125 — over 42 countries. I'd like to think that we sold a fair number of aeroplanes."

The world's oldest airworthy Moth, DH60 G-EBLV, first appears in Desmond's logbooks on 13 September 1962 with a practice for a Battle of Britain display. It was still in company ownership, and he'd been asked to take it on after the veteran Clem Pike retired from flying. In 'BLV, Desmond flew in the first ever Shuttleworth Collection display at Old Warden, 14 June 1964 the date. He remained proud of how Air Pictorial *said he "excelled" in the biplane. Soon the Shuttleworth aviation trustee Allen Wheeler recruited him as a collection pilot.*

"There was a display at Henlow on a Saturday and Sunday. All the senior chaps turned up and flew the exotic aircraft, and I flew the Tutor. I knew my place. Came the Monday, I turned up at Henlow and flew the Tutor back to Old Warden. I came back to Henlow to get in my car and go home, or go to work. 'Jacko' [Leonard Jackson, then manager of the collection] was there, and I asked him what was happening. He said, 'I don't know, because nobody's turned up'. We killed time for about an hour. He'd obviously been thinking about it, because he asked, 'Do you think you could fly the Avro 504?' Yes, I said. He gave me a brief on the rotary, and I delivered it to Old Warden. I came back, and he said, 'Do you think you could fly the Sopwith Pup?' I told him, 'In the First World War they went from 504s to Pups, so I think the answer is yes'. So, I delivered that. I ceased to be a tyro and became the rotary expert, just like that.

"Following on from that I flew the Bristol Fighter. 'Jacko' would invite me to tea at his house. This was a very formal, almost Victorian affair, with china cups, silver teapot, cake stand. It was also rather boring. He 'phoned one day and said, 'What are you doing tomorrow? Would you like to come to tea?' Since he was the manager and I wanted

RIGHT: Newly ensconced as a de Havilland development test pilot.
LOUGHBOROUGH UNIVERSITY ARCHIVE

to ingratiate myself, I told him, 'Yes, I'd be *delighted*'. He said, 'We'll take the Bristol Fighter'. Where will we take the Bristol Fighter, I wondered? 'We'll go and see [racing driver Sir John Whitmore] at his house in Essex'. I got in the Bristol Fighter, I flew it down, and fortunately managed to find this place [Orsett Hall]. He [was] a pilot and he'd got a bit of a strip. I put the Bristol Fighter down, we stayed and had tea — cucumber sandwiches — and we came back. You wouldn't do that in a Shuttleworth aeroplane nowadays…"

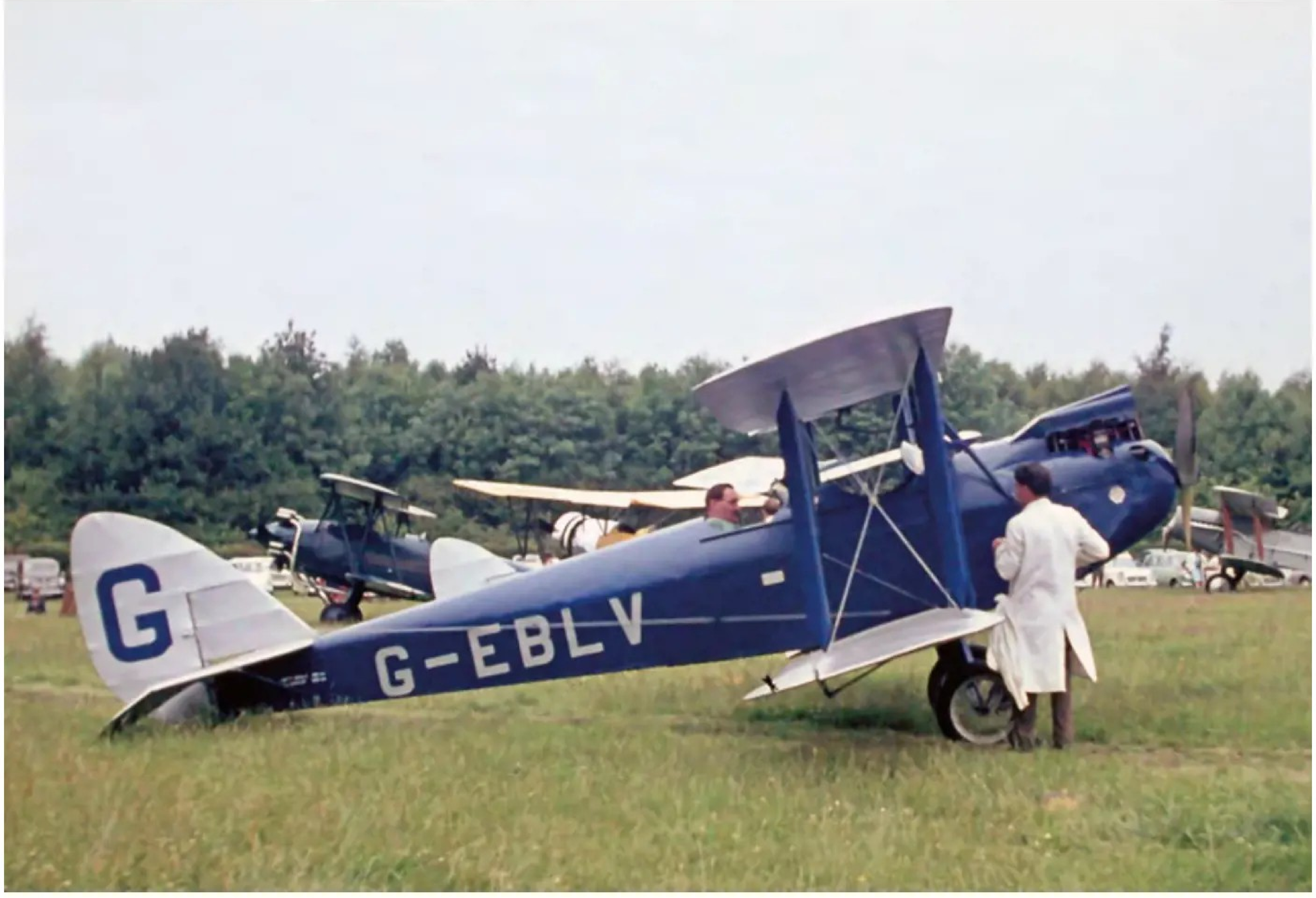
If there was a chance to fly a vintage aeroplane while away on business, Desmond took it. At the end of an HS125 sales tour in North America, in September 1968 he went to Old Rhinebeck, New York, and piloted a reproduction Sopwith Pup recently built by Richard King with an original 80hp Le Rhône. Then there was a very rare Bücker Student in Lugano, and the sole airworthy Hanriot HD1 in San Francisco.

It didn't always go so smoothly, as can be the case with historic machinery. A Shuttleworth event on 26 September 1971, marking the 60th anniversary of the first aerial post, saw a rare mishap. A logbook entry for the Blackburn Type D monoplane records, "Blown over, starboard wing in, prop smashed". Afterwards he noted how he went up in the replica Roe Triplane for a "penitential circuit in the rain."

Another rarity was the Reid and Sigrist Desford, then owned by Nick Grace. That Desmond flew in July 1973, in between Trident deliveries to China. The country's state airline CAAC had ordered 35 new-build examples, and Desmond planned the ferry flights before undertaking the first one himself. He went on to take several more out there, and to train CAAC's pilots.

"The Chinese did one thing for Hatfield: they insisted on a better build and a better paint finish. Before delivery to Canton we stopped in Hong Kong and got the aeroplane cleaned. Then we did the short flight to Canton. Once you flew into China you were there for a while, two or three months at a time. I got so bored in the hotel I started playing snooker, and I used to read the labels on the tonic water bottles. 'Most efficacious for the urinary tract', they said. It must have been translated in Victorian times.

"It was at the time of the Cultural Revolution, and we worked out of what looked like a Nissen hut in Canton that had Chinese hieroglyphics and, underneath, an English translation: 'Lackey Imperialist Running Dogs'. But they looked after us very well, and they were clever in their choice of pilots — some very experienced, some less so, and some not very good at all. I had to instruct through an interpreter, which didn't cause me a problem but did cause Pat Fillingham a problem on one occasion. The chap was landing



BELOW: Ready for an early Old Warden display in DH60 G-EBLV, then still Hawker Siddeley-owned.
TONY CLARKE

LEFT: **Desmond flew at all the major trade shows as part of his de Havilland and Hawker Siddeley duties. This is Farnborough 1968 at the helm of HS125-3B G-AVXL.**
DENIS J. CALVERT

a Trident, and I was watching. It was a thump of a landing, and he jammed his feet on the brake. Pat said, ‘Less brake’, which got translated as ‘brake’. *That* was a short-field landing.”

Retiring from Hawker Siddeley in 1974, Desmond stayed very closely acquainted with its products, especially the HS125. Among many other freelance jobs he set up the corporate aviation department for shipping conglomerate Globtik, worked for United Air Service in Nigeria, and twice managed the presidential flight in Malawi — all were 125 users. Alongside all this there was much enjoyment to be had from owning and flying two superb vintage aeroplanes, Arrow Active II G-ABVE and later the ex-Alex Henshaw Mew Gull G-AEXF.

Desmond became involved with the Active during 1978, when it was acquired by a syndicate of which he was part.

“Every year we would meet at the Steering Wheel Club in London and have an AGM, which consisted of just having a meal together. At one of these meetings we came to an end and somebody said, ‘Any other business?’ ‘Yes’, said someone else. ‘We’ve decided Desmond should buy the Active. He can fly it, he can restore it’. So I did. I never regretted it. I owned that aeroplane for 23 years. It was a little tricky, shall we say, simply because it had a short fuselage and, once the tail was down, there wasn’t enough airflow going over the rudder. You had to be very careful. It would ground-loop on you at the drop of a hat.

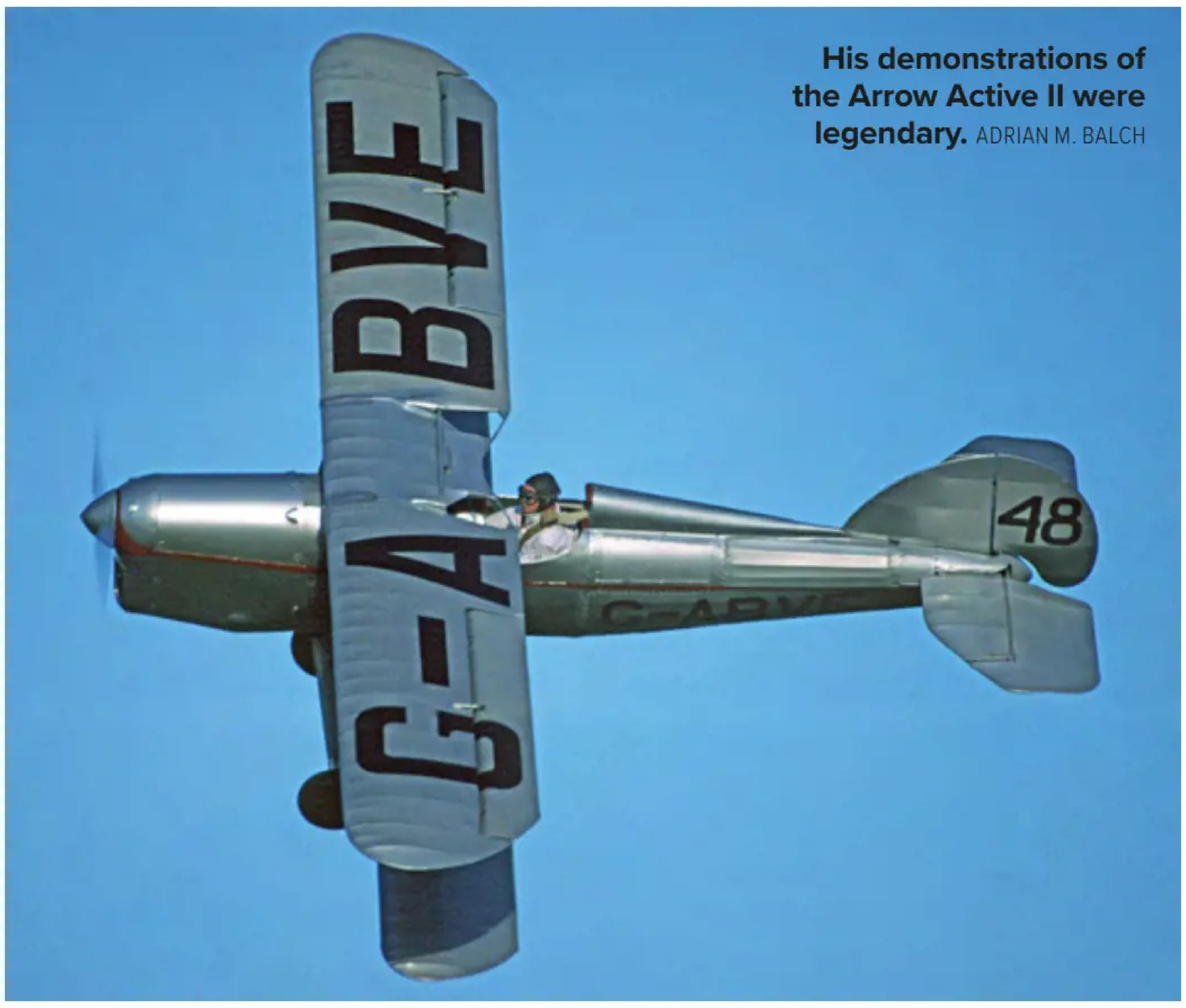
“The Mew Gull I bought almost by default. I wanted to buy it, but I had an incident at Redhill in May 1985. They didn’t tell me there was a ditch. You don’t see very much forward from the Mew Gull, so I up-ended it on landing. I’m not the type of individual who sticks his neck out unnecessarily, and if I’d known there was a ditch I wouldn’t have taken off. I spoke to [previous owner] Tom Storey, agreed a price and had it restored, back to Alex Henshaw’s 1939 Cape record configuration.”

> ***“I put the Bristol Fighter down, we had tea and came back”***

In the States, Desmond got to know test, air racing and display pilot John Penney. In April 1995 he went to Reno and was checked out on the SB Lim-2A, a Polish-built MiG-15UTI. In his subsequent report, Penney wrote, “Outstanding check-ride… Outstanding control of aircraft… This is one of the best check-rides I’ve witnessed”. Desmond later reflected on his assessment as a young RAF pilot of the Soviet fighter.

“I believed the Meteor could out-fly the MiG-15. When I got to fly

LEFT: **Suitable attire for a 31 March 1968 show in the Shuttleworth Sopwith Pup to mark the RAF’s 50th anniversary.**
LOUGHBOROUGH UNIVERSITY ARCHIVE



His demonstrations of the Arrow Active II were legendary. ADRIAN M. BALCH

ABOVE: Braving Shuttleworth's Bristol Boxkite replica. AIR PORTRAITS

BELOW: Trident 3B G-AWZB was his mount at the 1970 Farnborough show — for this particular demo he had Pat Fillingham as co-pilot. GORDON RILEY

the MiG-15, I realised how wrong I was. That aircraft was a little 'pocket rocket.' Its low-speed handling was treacherous, and its high-speed handling was equally lethal. But if you'd had RAF training on the MiG-15, you would have avoided those two areas, and it was a joy to fly. The MiG-17, on the other hand, was docile at both far ends."

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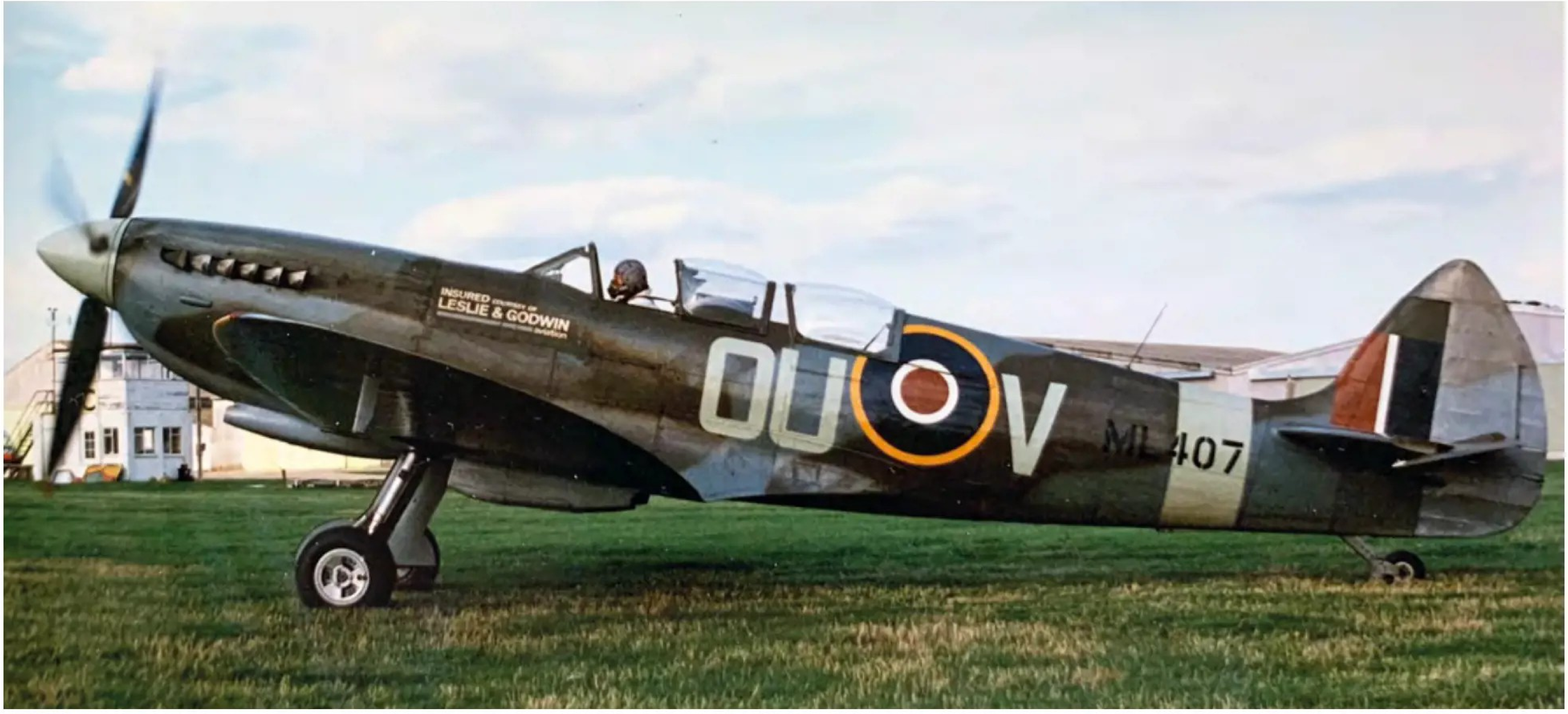
That MiG-17 was a Chinese-built Shenyang J-5, which he went to St Louis in September 1995 to fly. On consecutive days at the end of April and beginning of May 1998, he got current again on the SB Lim-2A and had his first flight in a Sabre, a Canadair-built model. And when the 50th anniversary of his first jet solo came up on 13 May 2002, he celebrated with a solo from Reno in the SB Lim-2A.

Always Desmond was fascinated to acquaint himself with the characteristics of different historic aircraft, and countless owners and operators trusted this vastly seasoned, courteous gentleman with them. Nick Grace, a fellow Loughborough graduate, put him in Spitfire IXT ML407, and Spencer Flack let him fly his P-51D Mustang *Sunny VIII*. On a 1991 trip to Scandinavia he joined Lars Ness in the Scandinavian Historic Flight's A-26B Invader, and captained it himself. He returned to a Vampire, an FB6 this time, thanks to the SHF, and Mikael Carlson sent Desmond off in his Tummelisa — yet another First World War-era type for the logbook. Out in Australia, there were two trips at the controls of Len Whittaker's Westland Widgeon, one of which was the final time Whittaker was airborne in the machine. The oldest de Havilland design he got his hands on was the DH-4M2 mail-plane owned by Al Stix at Creve Coeur, Missouri, which dates from 1919.

That was in 2007, a couple of years after Desmond had given his final public airshow display. It was at Old Warden, on his 75th birthday, in a Tiger Moth. He'd sold the Active and Mew Gull to the Real Aeroplane Company at Breighton during 2002, and most of his latter-day flying was in Moths, including a very special one-off return to DH60 G-EBLV half a century to the day since Shuttleworth's inaugural event. Yet still the occasional oddity appears, such as a San Marino-registered Tecnam P2006T twin he flew out of Old Warden with Jean-Michel Munn in the winter of 2016.

His regular steed, though, had become Tiger Moth G-AZZZ, owned by DH Moth Club founder Stuart McKay. This was on the long list of organisations, such as the Historic Aircraft Association, to which Desmond devoted much time and attention in retirement. At Henlow on 14 April 2018, he notched up another personal milestone: 70 years since that first solo. And how better to do so than in G-AZZZ? He spent 12 August that

Trident Three
G-AWZB
BEA



year taking people for rides from Henlow during the Gathering of Moths. After he'd finished, alone in the aeroplane, he went up for two more circuits. The occasion is marked in his logbook with one word: "Valediction". Afterwards, as he always did, Desmond left Stuart a note in the Tiger's cockpit to say thank you for letting him fly it.

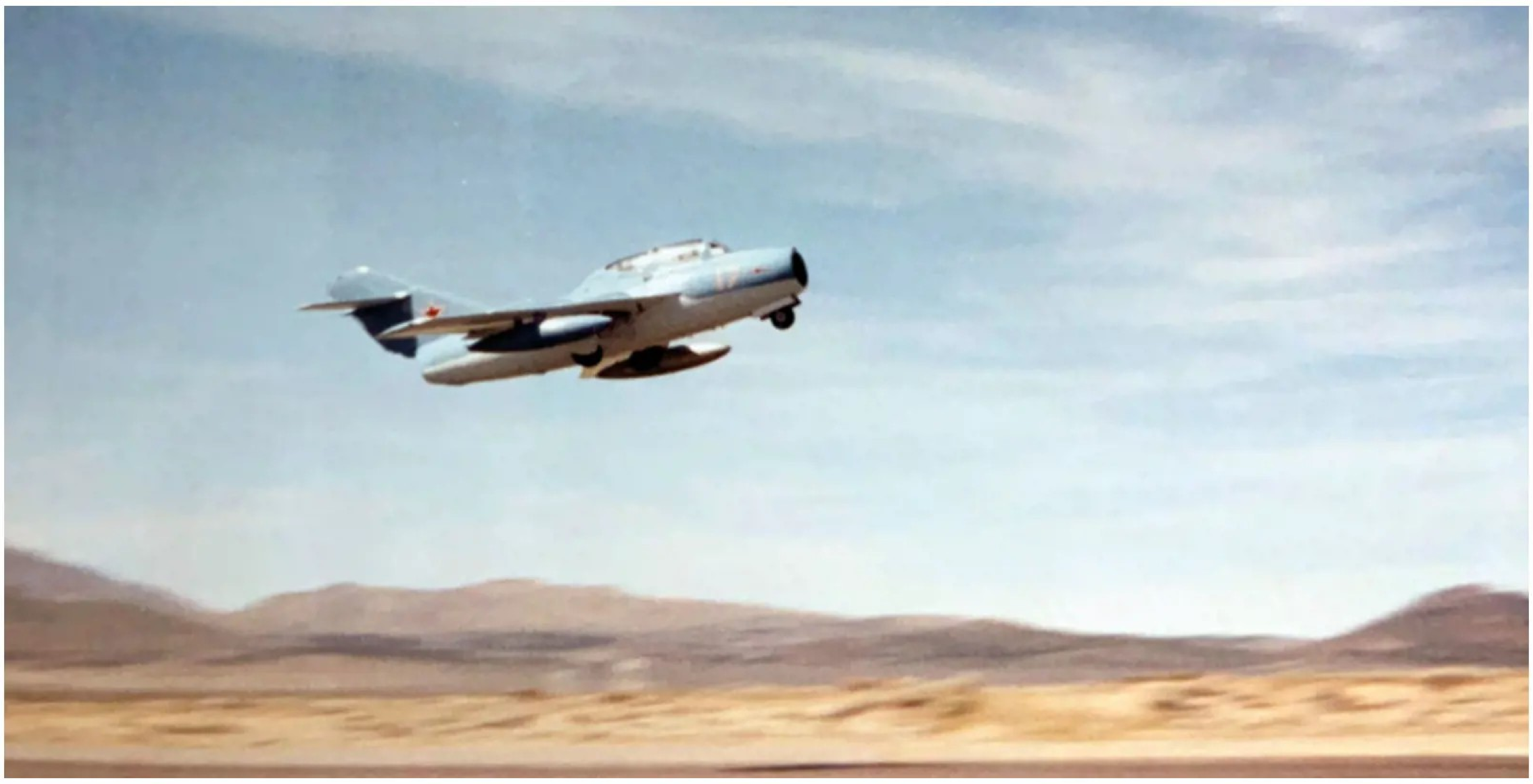
Being given an honorary fellowship by the Society of Experimental Test Pilots, and having Loughborough University name a road and its Aeronautical Engineering Atrium after him, were proud moments in later life. So was Loughborough's award of an honorary doctorate in technology. But Desmond had already given a great deal back. A sizeable donation to his old university funded a residential course to encourage more girls into science, technology, engineering and maths subjects. He sponsored three pilots through their commercial licences and five ground engineers to obtain their necessary qualifications, as well as helping raise money for charities such as Great Ormond Street Hospital.

Figures such as flying in excess of 300 different types and 600 air displays are hugely impressive, but don't tell anything like Desmond's full story. He once wrote, "I've run before the bulls in Pamplona (blame Ernest Hemingway), been a Cresta rider in St Moritz Tobogganing Club (blame Moore Brabazon) and flew from Kathmandu around the crest of Everest, into and out of China (a boyhood dream, I wanted to see the other side). I took the then crown prince to cover my back, in case I was caught". Not bad for a man who said of a hazardous test-flying age, "I didn't expect to get past 42, I really didn't."

Many who saw Desmond Penrose fly, and who enjoyed the benefit of his generosity and boundless experience, will feel very glad he did. A

With thanks to Camille Moret of the Loughborough University Library.

ABOVE: August 1987, and ready to go at Goodwood in Nick Grace's Spitfire.
LOUGHBOROUGH UNIVERSITY ARCHIVE



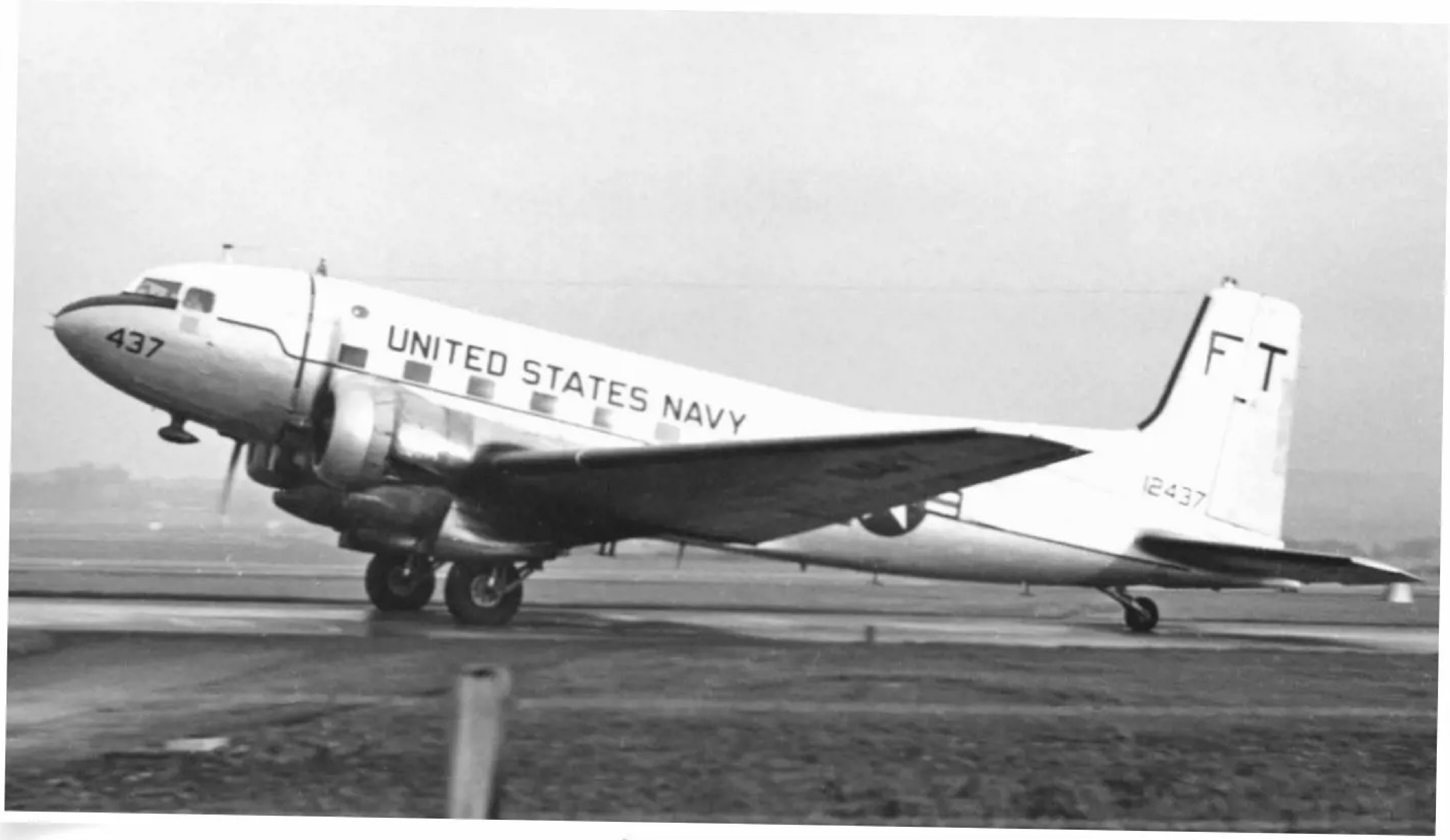
LEFT: Airborne from Reno in SB Lim-2A NX17KM, the first of several MiG experiences.
LOUGHBOROUGH UNIVERSITY ARCHIVE

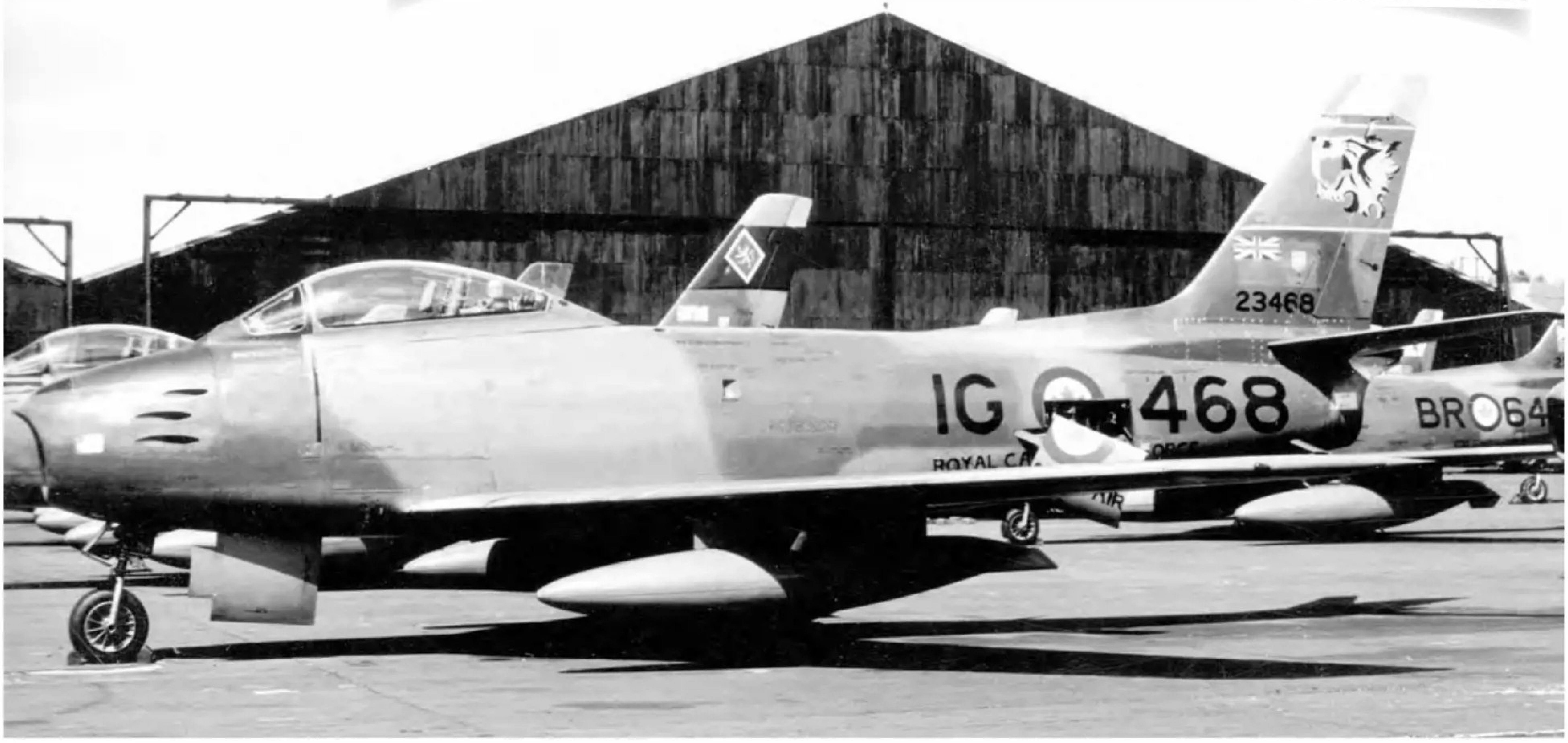
PRESTWICK'S HEYDAY

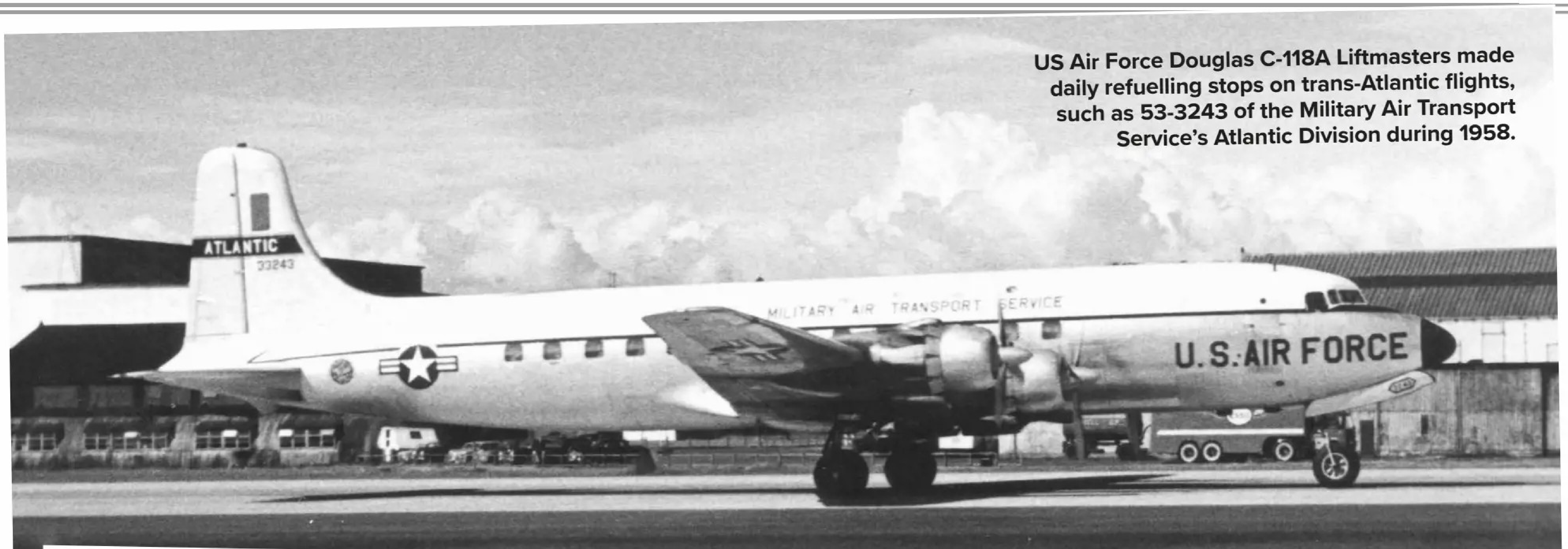
Glasgow's Prestwick Airport sees some interesting military visitors nowadays, but when **Tommy Morton** captured the goings-on there on a regular basis through the 1950s and '60s, their attendance was even more frequent and fascinating

RIGHT: Part of the small US Navy fleet air service squadron FASRON-200 based at RAF West Malling, Kent in the sixties, Douglas R4D-8 BuNo 12437 would have been a regular.

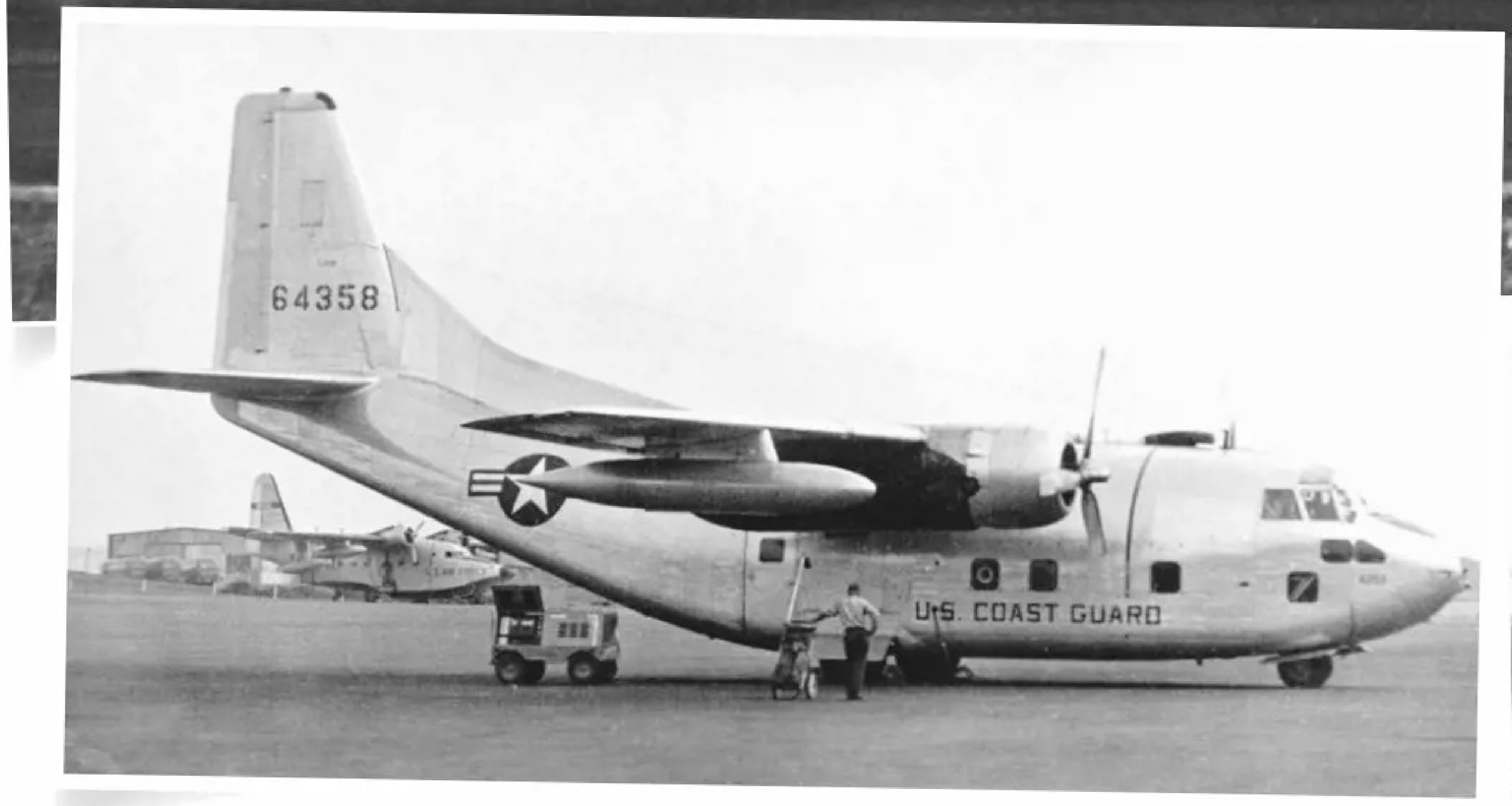
BELOW: As Prestwick-based Scottish Aviation had the contract for deep maintenance of the Royal Canadian Air Force's fleet of Canadair Sabres in Europe, they were a common sight. Sabre 6 RCAF 23468 — in the markings of 439 Squadron stationed at Marville, France — was present in May 1958 along with examples from various other units.

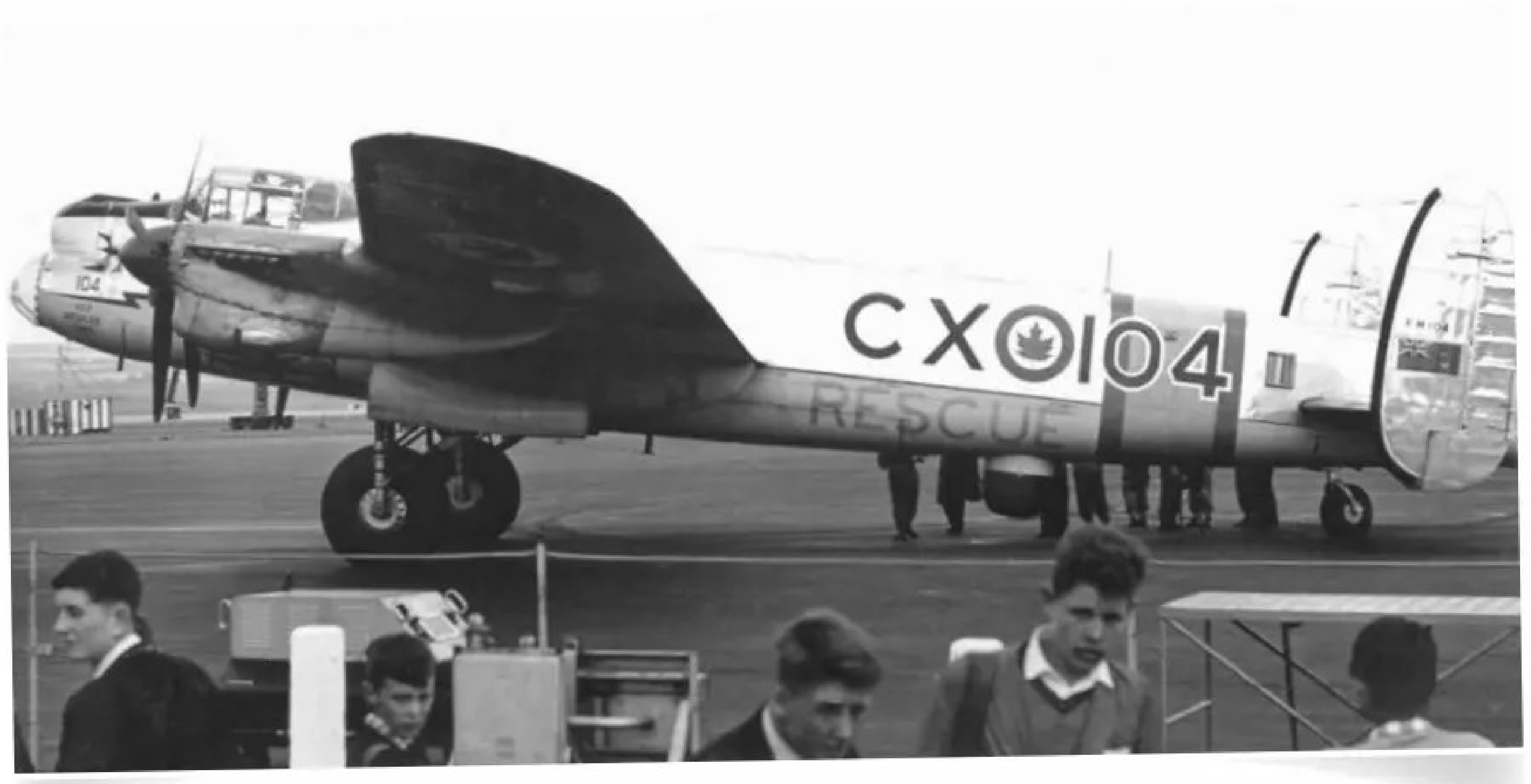






US Air Force Douglas C-118A Liftmasters made daily refuelling stops on trans-Atlantic flights, such as 53-3243 of the Military Air Transport Service's Atlantic Division during 1958.

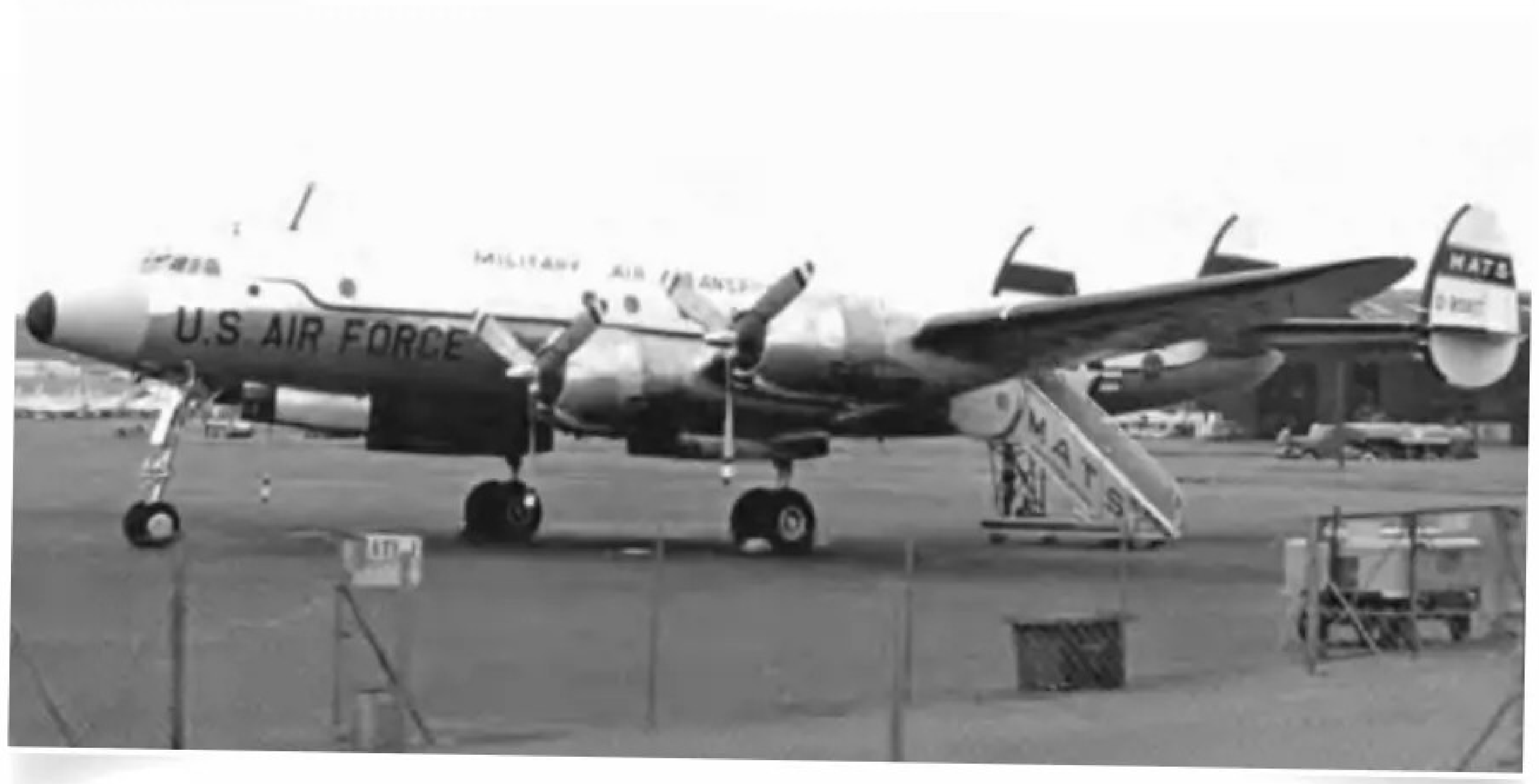


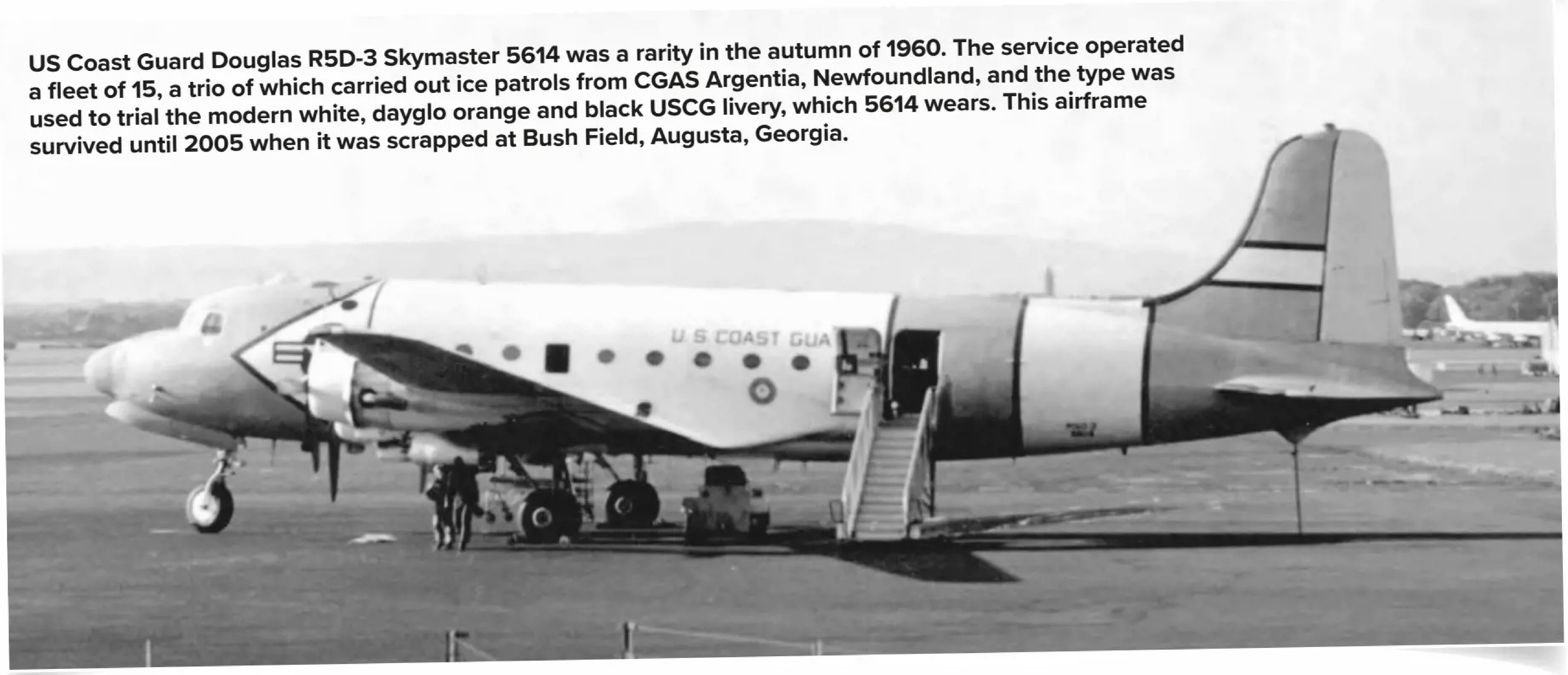


ABOVE: US Coast Guard Fairchild C-123B Provider 56-4358, present in 1960, may have been on delivery to Coast Guard Air Station Naples where it served into the 1970s before being returned to the USAF. A Grumman SA-16 Albatross of the USAF's 67th Air Rescue Squadron is in the background; this unit was stationed at Prestwick to provide SAR coverage of the northern trans-Atlantic route from 1957-60.

ABOVE RIGHT: The RCAF's Lancaster Xs served in the maritime role into the 1960s. Those of 107 Rescue Unit at RCAF Station Torbay, Newfoundland, occasionally came to Prestwick and FM104 was one such in September 1959. Withdrawn in 1964, it was displayed on a pylon at Toronto Airport for many years before being acquired in 2018 by the British Columbia Aviation Museum, where it is in a dismantled state awaiting restoration.

RIGHT: Lockheed C-121A 48-0617 of the Military Air Transport Service awaits its passengers in August 1959.





US Coast Guard Douglas R5D-3 Skymaster 5614 was a rarity in the autumn of 1960. The service operated a fleet of 15, a trio of which carried out ice patrols from CGAS Argentia, Newfoundland, and the type was used to trial the modern white, dayglo orange and black USCG livery, which 5614 wears. This airframe survived until 2005 when it was scrapped at Bush Field, Augusta, Georgia.

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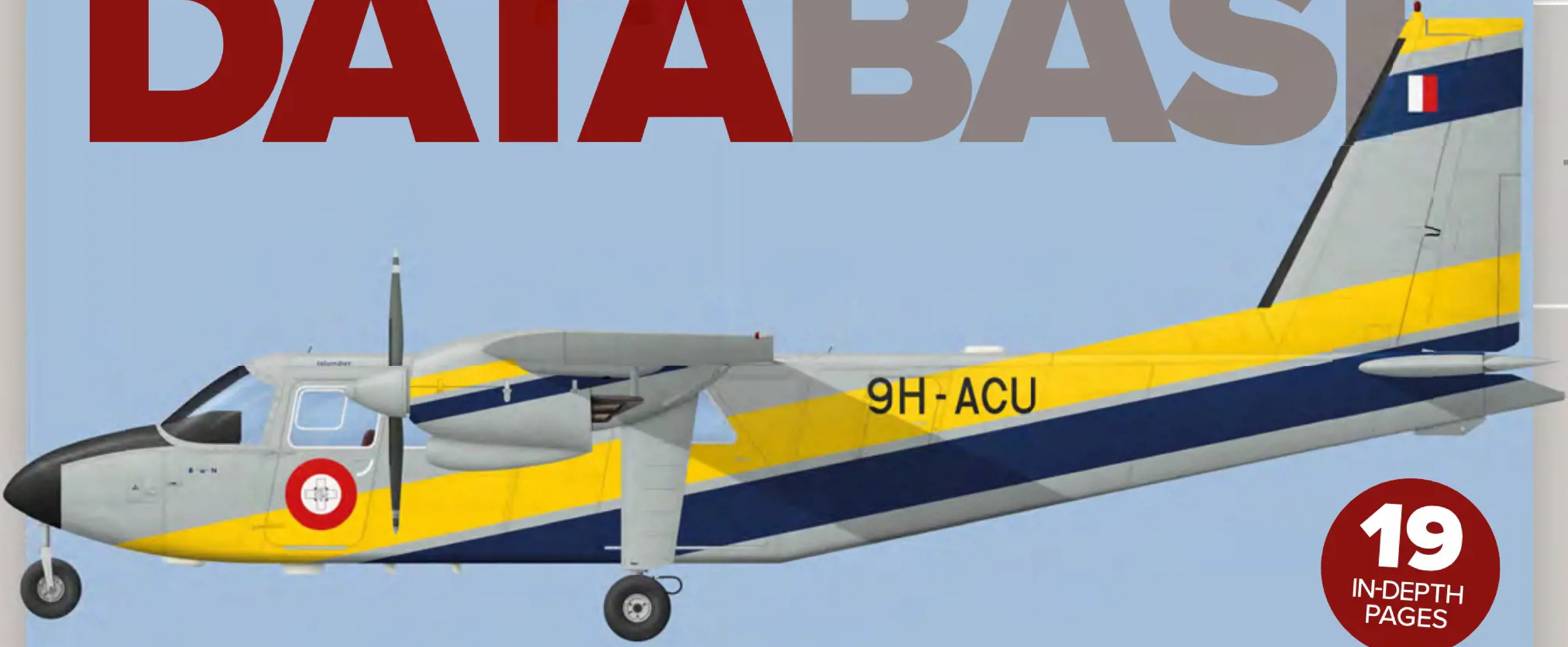


19 IN-DEPTH PAGES

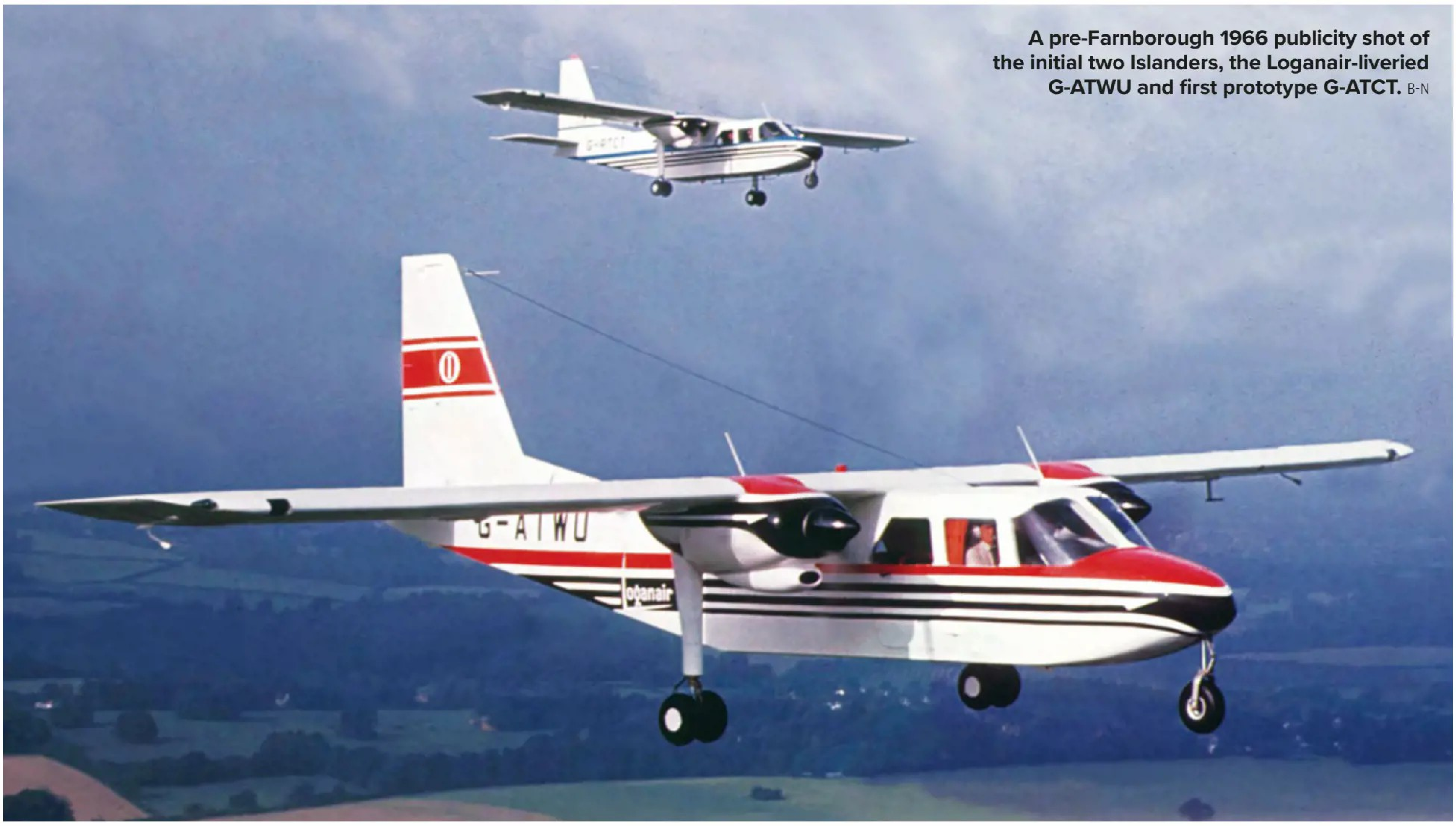
BRITTEN-NORMAN ISLANDER

WORDS: MATTHEW WILLIS

TOP: BN-2B-26 Islander 9H-ACU joined the Armed Forces of Malta in November 1995 as the first of two for its Air Squadron. It was later given military serial AS9516, but has since been retired. CHRIS SANDHAM-BAILEY

MAIN IMAGE: OLT Ostfriesische Lufttransport is a long-standing Islander operator. BN-2B-20 D-IOLO *Bremerhaven* counts among its newer specimens, here getting airborne from the small airport on the North Sea island of Helgoland — classic territory for the type. KEY

This unassuming jack-of-all-trades has been a rare thing in aviation: a British world-beater



A pre-Farnborough 1966 publicity shot of the initial two Islanders, the Loganair-liveried G-ATWU and first prototype G-ATCT. B-N

Britten-Norman's BN-2 Islander is still in production and sees widespread use with operators throughout the world. Yet this ageless aircraft first took to the skies fully 60 years ago, meaning Islanders have been flying for virtually half the period since powered, heavier-than-air flight began.

The Islander was the brainchild of John Britten and Desmond Norman, graduates of the de Havilland Aeronautical Technical School. Britten's background said little about his future in aviation — he had studied at the Royal Naval College, Dartmouth, originally intending to go into the submarine service. Norman, on the other hand, was aviation royalty, an old Etonian whose father had helped found Airwork, and whose elder brother Mark was one of the first directors of Beagle Aircraft.

The pair met at the DHAeTS in 1946 during their engineering apprenticeship. Norman spent two years in the RAF after graduating but maintained contact with Britten, and in 1949 the pair formed a partnership. The first aircraft they designed and built was the BN-1F, a parasol-wing ultralight, constructed with Peter Gatrell in 1951. Unfortunately, according to journalist and pilot John Fricker, it "flew like a crippled bird". It was an inauspicious beginning. Nevertheless, Britten-Norman Aircraft was established in 1952, consisting of the founders plus a few employees, converting DH Tiger Moths for crop-spraying in premises at Bembridge on the Isle of Wight.

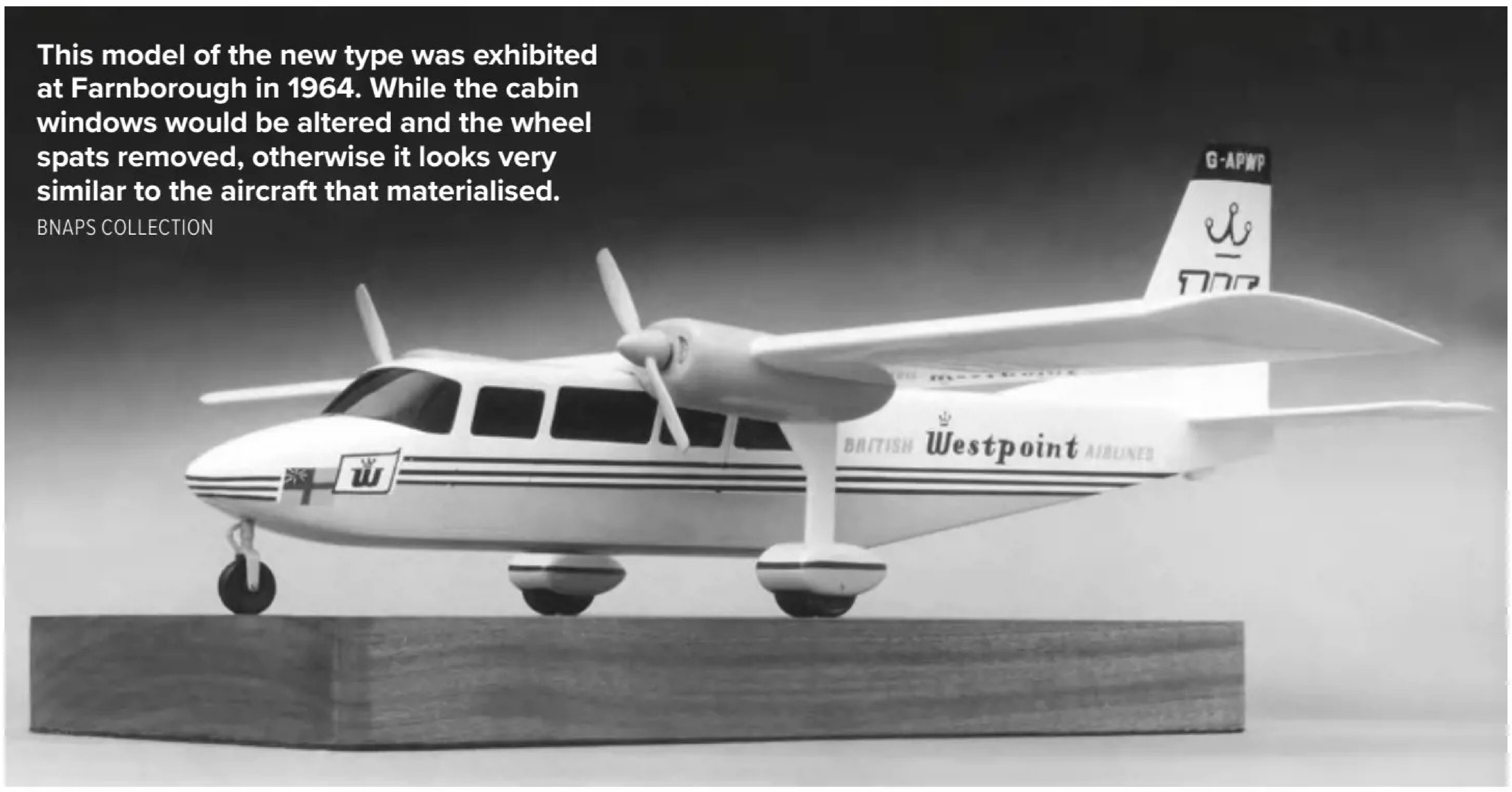
More indicative of Britten's and Norman's talents than the BN-1F was their development of the Micronair atomiser, a mechanism for chemical spraying that could be retrofitted to existing aircraft. It demonstrated an ability to spot a gap in the market and meet it with a simple but ingeniously engineered solution. As well as manufacturing the Micronair kit, they established their own agricultural operation with two Tiger Moths and an Avro Anson.

Britten and Norman were able to revisit aircraft manufacture in 1956, with greater success, albeit not with a machine of their own design. The pair had established a relationship with the Popular Flying Association during construction of the BN-1F, and now the PFA came with a request to build a Druine Turbi. This was part of a promotional scheme for the organisation, the build to be covered by weekly television broadcasts. The Turbi, G-APFA, was completed in May 1957 and served as the PFA's 'flagship'. It still exists, and is under restoration to fly.

Desmond Norman (left) and John Britten with an Islander at the Bembridge factory airfield. B-N

In 1959, Britten and Norman turned their attention to hovercraft, leading to the Cushioncraft venture. This resulted in a series of prototypes but no production vehicles, and the hovercraft arm of B-N was sold to the British Hovercraft Corporation.

Around this time, Britten and Norman noticed that light aircraft manufacturers, particularly those in the US, were responding to advances in technology by improving performance but not capacity. Increases in engine power and aerodynamics were met with greater complexity, including retractable undercarriages, which multiplied weight, cost and maintenance requirements. Yet the typical light twin still only carried around four to six passengers. Meanwhile, commuter airlines represented the fastest-growing part of the general aviation sector, and aircraft such as the DH Dragon Rapide were being withdrawn due to age. Britten and Norman considered that with careful design, a capacity of 10 could be achieved on the same power as a Piper Aztec or a Beech Baron, dramatically enhancing economy.


This model of the new type was exhibited at Farnborough in 1964. While the cabin windows would be altered and the wheel spats removed, otherwise it looks very similar to the aircraft that materialised.
BNAPS COLLECTION

With yet more ambition and foresight, they determined an aircraft for this market should be straightforward and tough, with low maintenance needs, to enable its use in remote and inhospitable locales. It should be able to operate from short and unprepared runways with the minimum of infrastructure and technical support. These features would maximise sales potential.

For the same reason, Britten and Norman were keen not to present the aircraft as a specialised STOL machine or bush-plane. STOL and unprepared field operation was often associated with complex high-lift devices and reduced performance. Their ingenious solution was far simpler. In 1968, John Britten described the idea as, "simply to use low wing- and span-loadings, which are far more effective than any special high-lift gadgets… There are no high-lift devices on the Islander. We just give people more wing than anything else". He added, "We don't call the Islander a STOL aircraft, although it is, because people think that this puts the price up."

According to Britten, the simple adoption of a large wing afforded the Islander better short-field performance than specialists such as the Dornier Do 28 or the de Havilland Canada Twin Otter. At the same time, "The low span-loading gives a good single-engine performance."

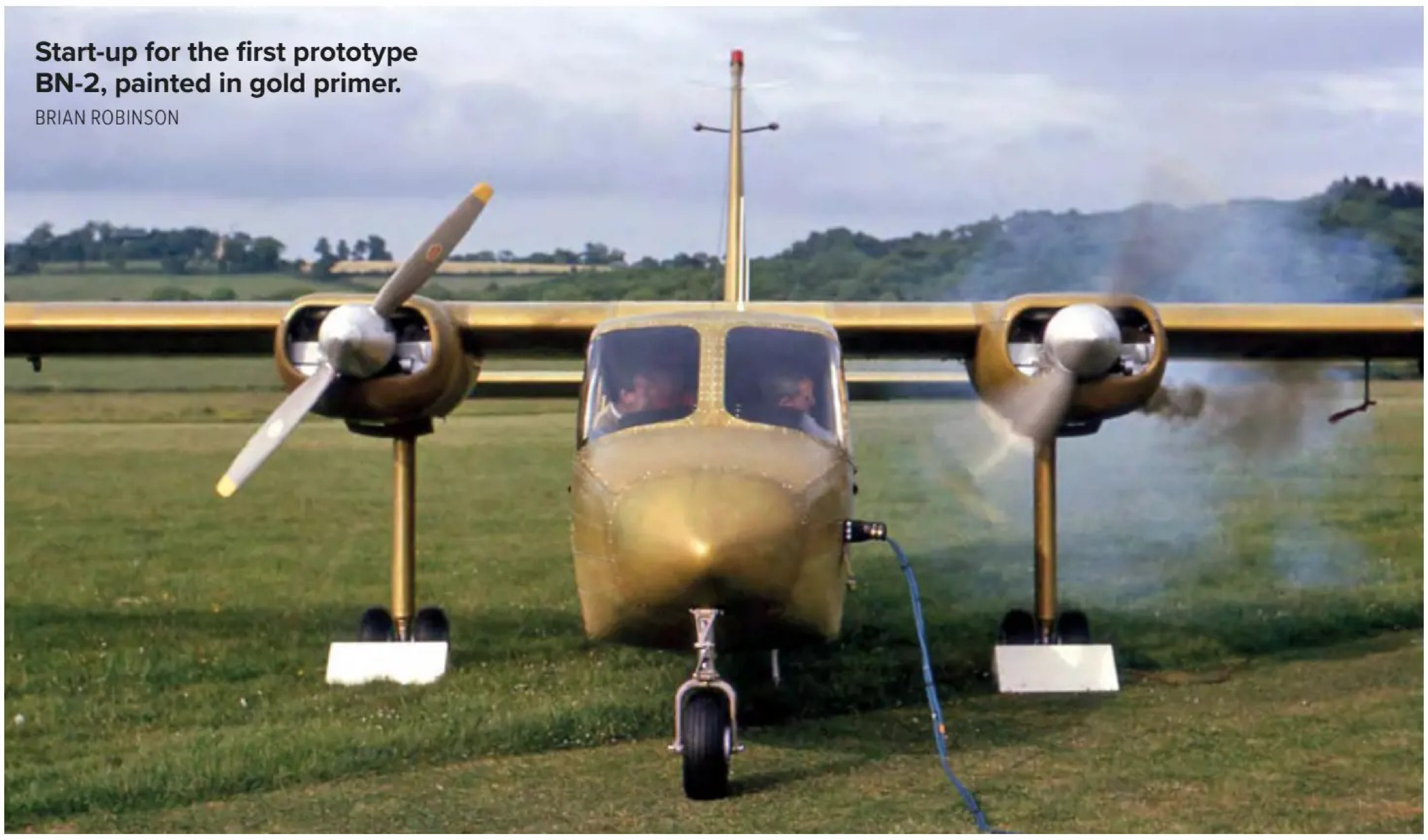
> ***"It was elegant in its simplicity, if not in its appearance"***

Simplicity was key. A fixed undercarriage was employed. The wing was a constant-chord 'plank' design so the ribs could all be the same, and had no dihedral so the spars were straight from tip to tip. Dihedral effect was gained from upswept wingtips, which were removable fibreglass items. The fuselage was a straightforward 'box' design with a constant-section forward part and a constant-taper tail.

Another ingenious move was to eliminate the central aisle from the fuselage by the use of several large 'minibus'-style side doors. This came with numerous advantages. Most notably, it kept aerodynamic frontal area down, offsetting some of the drag of the large wing and fixed undercarriage. It also made it possible to fit simple full-width bench seats, fixed to hold-down points which could be used for cargo lashings when the seats were removed. It was elegant in its simplicity, if not in its appearance.

Design of the new aircraft, designated BN-2, began formally in 1963, followed by construction of a prototype from September 1964 to be powered by two Rolls-Royce Continental IO-360B six-cylinder, 210hp engines. While this took shape at Bembridge, six engineers were seconded from Miles at Shoreham to help. One of them, Brian Robinson, was responsible for the design of the engine installation, which was notably similar to that of the Piper Cherokee Six and, like everything about the BN-2, straightforward and practical. Returning the favour, B-N later subcontracted some airframe customisation to Miles.

Following initial 'hops' the previous evening, on 13 June 1965 the prototype BN-2 G-ATCT made its first flight,


Start-up for the first prototype BN-2, painted in gold primer.
BRIAN ROBINSON

with Desmond Norman at the controls and John Britten in the right-hand seat. The sortie lasted an hour and 10 minutes. Just four days later G-ATCT departed Bembridge for the Paris Air Show. The name Islander was selected only the day before it left, the result of a competition for B-N staff, won by Arthur Rayner and Ted Smith who coincidentally came up with the same idea.

On the flight of the initial aircraft, the Wilson government agreed a loan of around £500,000, to be paid back with a levy on sales, helping the company gear up for production. After the display at Paris, B-N launched into a development flying programme. The Continental engines were replaced with two Lycoming O-540s offering 260hp, a helpful increase in output. This was the most significant change made to the aircraft during its development. Since then, the vast majority of Islanders have been powered by engines from this family.

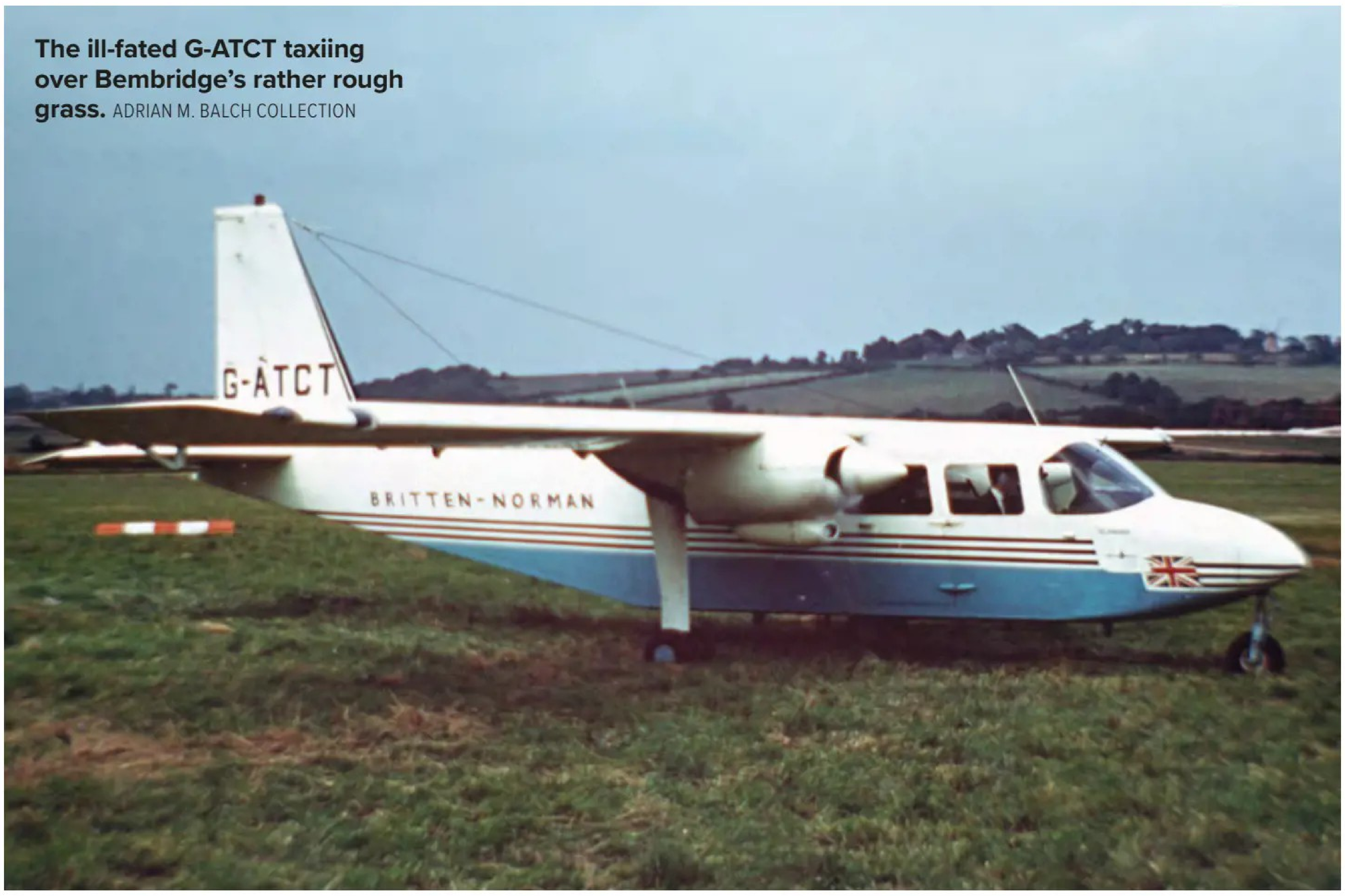
One of G-ATCT's preliminary 'hops' on the evening of 12 June 1965. BRIAN ROBINSON

B-N put on a showstopping performance at the SBAC show at Farnborough in September 1966, with two aircraft. G-ATCT was joined by G-ATWU, which B-N staff toiled round the clock to complete. So hard did the factory work to ensure two Islanders could appear at Farnborough that the company gave most of its employees a day off to attend.

G-ATWU was earmarked for Loganair, in whose colours it was finished. It was also flown at the show by Loganair founder Duncan McIntosh, while G-ATCT was in the hands of B-N senior test pilot Jim Birnie. *Air Pictorial*'s reporter wrote, "A thorough examination served only to confirm one's original impression that here is something quite exceptionally good. The flying display also confirmed this impression… Being born and bred on a small grass airfield, such as Bembridge, is obviously good for the breed of STOL types. The Islander was described by one commentator as stealing the show, and there are few who would disagree with him."

G-ATWU was regarded at the time as the first production Islander, but tragically G-ATCT was lost when it crashed in the Netherlands that November, returning from a European sales trip, with the loss of test pilot Peter Hillwood and B-N's prospective German sales agent Albert Weerda. Bad weather was a major contributory factor in the accident. The second aeroplane therefore took over the development role and was retained by B-N. In its place, Loganair would receive the fourth aircraft, G-AVKC. Meanwhile the third Islander, now considered the first production machine, was acquired for Glos Air, owned by former England cricket captain Derrick Bailey. This aeroplane, G-AVCN, was shown off to the press at Bembridge in April 1967 and displayed at the Paris Air Show in June, full type certification being granted that August.

While the Islander had already proved to have a fundamental rightness that would see it exceed six decades in production in substantially the same form, B-N did not rest on its laurels. With the


The ill-fated G-ATCT taxiing over Bembridge's rather rough grass. ADRIAN M. BALCH COLLECTION

> *"The Islander already showed a rightness"*

28 May 1968 brought a unique event, as BN-2A G-AVUB —destined for the Stapleford-based Herts & Essex Aero Club — landed on the aircraft carrier HMS *Hermes*, and took off from it again, in Portland Bay. PETER R. MARCH

G-AVUB
HERTS & ESSEX AERO CLUB

type now in production, small improvements were introduced almost immediately. The 25th aircraft was to the upgraded BN-2A specification, with the gross all-up weight increased by 295lb. Type certification was achieved on 31 July 1968. Further updates were incorporated as series numbers, so the BN-2A was succeeded by the BN-2A-2 with a side-loading baggage compartment, modified instrumentation and aerodynamic refinements that helped performance in hot and high locations. The Series 2 also introduced an adjustable pilot's seat.

B-N had been planning the BN-2S with turbocharged R-R Continental TSIO-520-E engines, but the better hot-and-high performance of the BN-2A-2 rendered it unnecessary. However, a more powerful standard version was offered from 1970 in the form of the BN-2A-3, with 300hp Lycoming IO-540-K units, using fuel injection in place of carburettor induction. By the late 1970s, production of the piston-engined variety had reached Series 27. Refurbished aircraft were routinely brought up to the latest production specification.

In 1968, when G-ATWU, the second aircraft, was no longer required for the standard Islander programme, it was modified into the prototype for the prospective BN-2A MkII Islander Super. This entailed a 33in plug being inserted in the fuselage to enable an additional row of seats. The Islander Super did not progress, as US regulations ruled out the use of bench seats on a twin-engined type with passenger numbers greater than 10, limiting the prospective market. G-ATWU later received a further fuselage extension and additional modifications to become the prototype BN-2A MkIII Trislander.

In its guise as the sole Islander Super, G-ATWU incorporated a 33in fuselage stretch. BNAPS COLLECTION

Cash-flow crisis

The 100th Islander was completed on 24 June 1969, less than 16 months after the type first went into service. The 200th followed just a year later. Demand overwhelmed the capacity of the small Bembridge factory, so a new assembly plant was constructed there, and contracts for the construction of large assemblies were struck with other manufacturers. First, the British Hovercraft Corporation, part of the Westland Group, was engaged to produce sets of components for 236 aircraft from its Cowes factory. Then, as part of a broader package of deals between the UK and Romanian governments, Intreprinderea de Reparații Material Aeronautic (IRMA) was contracted to manufacture Islanders, which would be flown to Bembridge for finishing.

Despite the remarkable, even unprecedented success of the Islander in its early years, during 1971 B-N experienced a cash-flow crisis which threatened to bring production to an early end. The deal with IRMA meant a pre-agreed number of aircraft had to be produced regardless of demand. Naturally, after the initial blizzard of orders was fulfilled there was something of a slump in sales, and new aircraft began building up at Bembridge. Around half of the loan from the UK government still had to be repaid, and B-N was effectively running on debt from investors, most of it from a subsidiary of Lloyds Bank.

In late 1971, Lloyds demanded repayment of around £2 million, and B-N was compelled to call in the receivers. Fortunately the receiver, Monty Eckman, was determined to keep B-N running and sought a buyer for the whole firm. In the light of the Islander's popularity, six companies expressed an interest, and production continued while the financial issues were addressed. In fact, by the summer of 1972 when Fairey Group's bid was selected as the successful one, B-N was operating at a profit, with numerous fresh orders for Islanders as well as the new Defender — a military variant introduced in 1970 — and Trislander.

> ***“Demand overwhelmed the factory”***

❖

Sadly for B-N, the deal meant full production of Islanders and Trislanders would no longer take place at Bembridge, although the facility was retained for design, development, marketing and customisation. Production and assembly thereafter occurred at Fairey's Belgian factory at Gosselies, where economies of scale made the work more competitive. John Britten and Desmond Norman were retained as managing directors for a transition period, before Dr Gordon Watson took over in 1976, having been brought in from Scottish Aviation.

A fourth location for Islander manufacture was added in 1974 when the Philippines government agreed a deal for the purchase of 100 aircraft for local use. These were provided as kits for local assembly.

However, there were underlying problems with the management of the new parent company, and Fairey went into receivership during 1977. Britten-Norman was sold in 1979 to the Swiss manufacturer Pilatus, which moved production back to Romania.

The debut of the new BN-2T was made by demonstrator G-BPBN (formerly G-BCMY) at the 1980 Farnborough show. ADRIAN M. BALCH

Turbine power

The further-improved BN-2B model was introduced in 1978. Shortly after this, B-N started work on what would become the BN-2T Turbine Islander. This replaced the standard Lycoming engines with Allison 250-B17C/F 400shp turboprops.

The initial plan was to use a new Lycoming LTP101 turboprop of around 600hp, but the recently arrived managing director, Gordon Watson, sensibly suggested the substitution of a less powerful unit. The chief advantage of the turbine was an increase in power, offering a useful growth in payload, at the cost of somewhat less efficiency in frequent operations over short sectors, for which piston engines remain the most suitable powerplant. The Allison still represented a significant increase in power from the 260hp Lycoming piston. This decision was vindicated in 1977 when G-BDPR was fitted with LTP101s and was found to be overpowered, even with a Trislander-style long nose for additional cargo carriage. Interestingly, G-BDPR was later converted back to piston power and was in service as late as 2016 as the only 'long-nose' Islander still in existence. The Allison-powered BN-2T underwent what the company described "a relatively quick and trouble-free development period," and the first aircraft, G-BPBN, flew on 2 August 1980.

Watson rationalised development somewhat, axing projects for amphibious floatplane and fire-bomber variants, and suggesting the replacement of the former with a flying boat study. He encouraged the turbine engine programme with the somewhat more realistic 400hp powerplant, and attempted to drive a programme of careful drag-reduction and increased efficiency, retaining all the good points of the Islander family while boosting performance. But it was by now apparent that the parent company Fairey was in difficulty, which curtailed much of the development activity in the late 1970s. One such effort that was taken no further was the BN-4, a scaled-up 19-seat turboprop Islander which was intended to compete with the DHC Twin Otter.

The most substantial redesign of the Islander to reach full production was the BN-2T-4S Defender 4000, which was initiated in 1993. This aimed to offer significantly greater endurance for military and police surveillance work, while keeping the STOL benefits of the basic aircraft. It featured a lengthened fuselage and the increased-span wings of the Trislander, as well as a longer nose and taller fin, and was powered by the 400hp Allison 250-B17F engines of the existing BN-2T.

While Gordon Watson's flying boat suggestion went no further at the parent company, the proposal was resurrected by an Australian businessman, Ken Heeley, 20 years later. The configuration of the Islander, with its high wing and wing-

A notably mean-looking Defender 4000 is G-WPNS, which was used as a B-N company demonstrator. It had been G-BWPU on manufacture, and then G-GMPB with Greater Manchester Police. BEN DUNNELL set engines, lent itself better to the flying boat layout than the floatplane, and David Thurston was charged with adapting the design with a planing hull section grafted to the bottom of the fuselage, adding a water rudder, amphibian undercarriage and outboard floats. The flying boat Islander would have been powered by turbocharged Lycoming TIO-540 engines of 350hp. A 1/5-scale model was tested to assess the viability of the conversion, but despite high hopes the project apparently fizzled out.

> ***“The Islander’s resilient history is set to continue”***

To the present day

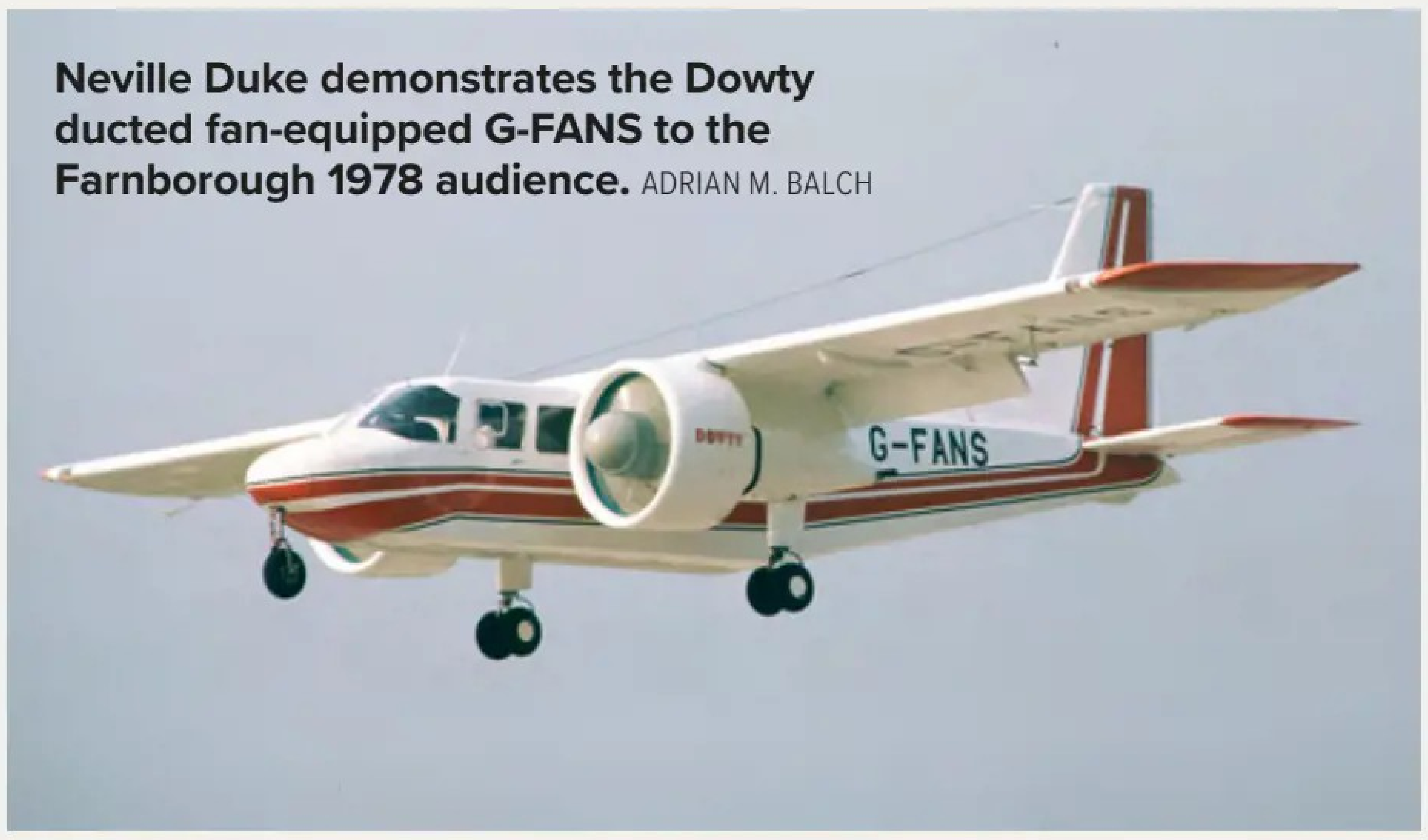
Ownership of B-N changed hands several times from the late 1990s onwards, but production was able to restart in each instance. In 1998, Pilatus sold B-N to Litchfield Continental, a UK-based investment group. Two years later the company went into receivership again, and was acquired by a group of investors based in Oman. It set up a major British operating base at Solent Airport, Hampshire — the former RNAS Lee-on-Solent — during 2010.

B-N announced in 2023 that production was being repatriated to Bembridge from Romania. The line there was opened on 21 September, with ambitious plans existing to complete 29 new aeroplanes by 2029, by which time the production rate was to have risen to eight aircraft a year. Early in 2024, the company announced that additional investment had been secured with a buyout by Shelton Bidco, and the sometimes rocky but remarkably resilient production history of the Islander looks set to continue. As of May 2025, 1,299 Islanders have now been built.

DATAFILE

QUIETER, CLEANER AND GREENER

While development to improve and update the Islander in service continues, the type has also acted as a testbed for new aviation technologies. In 1977, a 1971-built BN-2A-3 was modified with Dowty ducted fan propulsors instead of propellers. To enable the fan units to be fitted entirely below the level of the wing, the engines were relocated to around half-way down the undercarriage legs. The aircraft was adapted by Miles at Shoreham, and re-registered G-FANS.

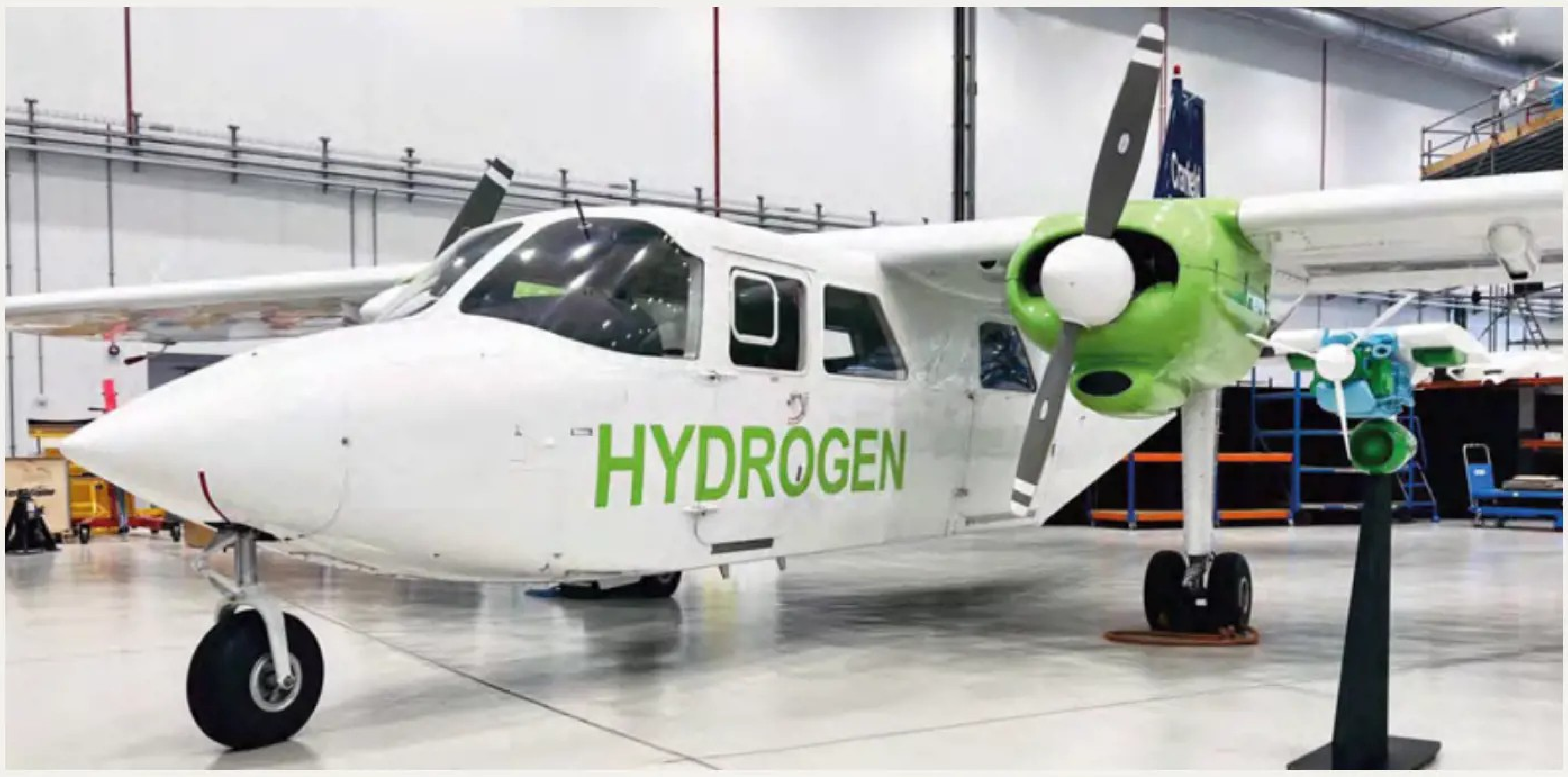


Neville Duke demonstrates the Dowty ducted fan-equipped G-FANS to the Farnborough 1978 audience. ADRIAN M. BALCH

Dowty developed the variable-pitch ducted fan for both jet and piston engines, to increase efficiency and reduce noise. G-FANS trialled the Dowty propulsor from June 1977, when Neville Duke acted as test pilot for the maiden flight, until August 1983, when the aeroplane was returned to B-N and converted back to standard specification, before going on to the Halfpenny Green Parachute Club as G-HGPC. Despite much development, the ducted fan concept never progressed to mainstream use.

The Islander continues to be attractive as a powerplant testbed, and current programmes involve low-emissions technologies that promise to take light aviation into the post-fossil fuel age. One of these is Project Fresson for hydrogen-electric fuel cell power with a low-drag heat exchanger, an agreement between B-N, Cranfield Aerospace Solutions, Reaction Engines and other partners signed in October 2021. BN-2B-26 G-HYUK was due to be converted as a prototype hydrogen-powered aircraft. The electric component of the drivetrain will be an innovative axial flux motor, which promises to be both lighter and more environmentally friendly than the conventional radial flux layout motor. There is currently a degree of uncertainty over the future of Project Fresson, with delays to the completion of the prototype and questions over funding. Only time will tell whether the prospective benefits will be realised.

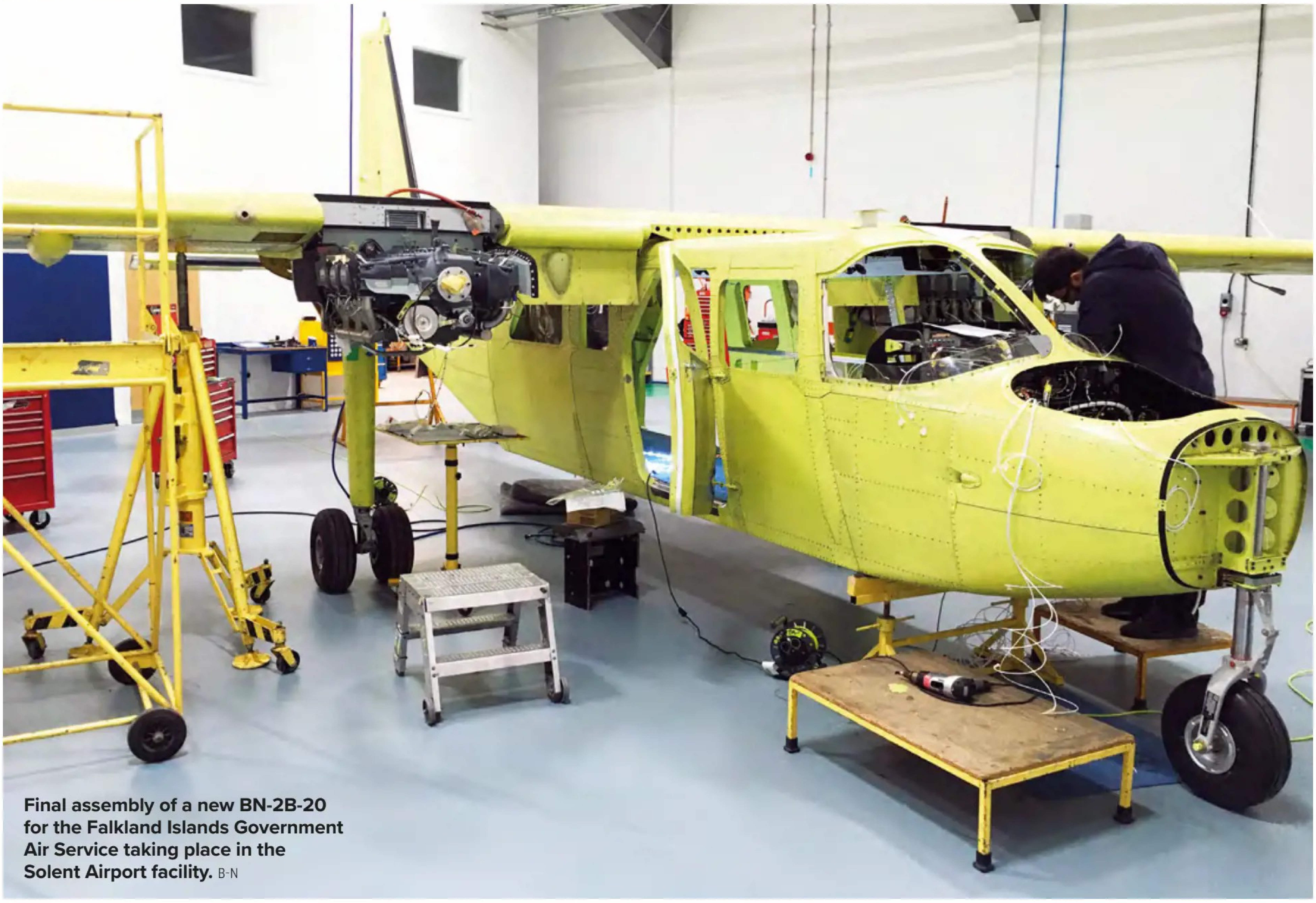
Other sustainable aviation projects are centred around the Islander as well. In January of this year German firm Evia Aero signed a letter of intent with B-N for 15 new aircraft, to be delivered from early 2027 onwards, which will “subsequently be converted to zero-emissions platforms powered by hydrogen fuel-cell propulsion systems.”



BN-2B-20 G-HYUK is the planned Cranfield Aerospace testbed for its hydrogen fuel programme, a model of the powerplant set-up being displayed in front of the aeroplane. CRANFIELD AEROSPACE

TECHNICAL DETAILS

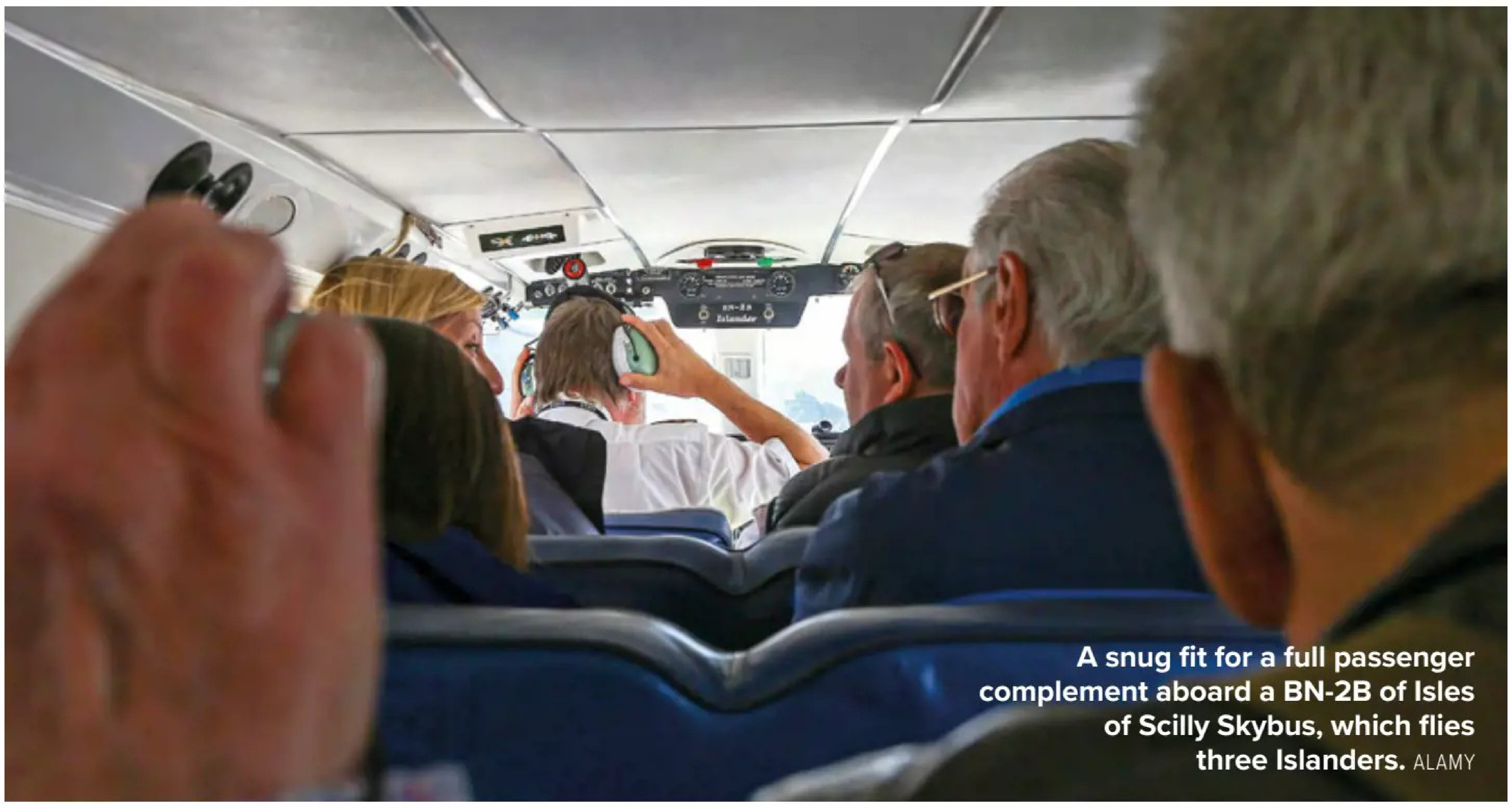
A design that proved inherently right from the start



Final assembly of a new BN-2B-20 for the Falkland Islands Government Air Service taking place in the Solent Airport facility. B-N

The BN-2 Islander series is a twin-engined, high-wing, fixed-undercarriage light passenger and utility aircraft built chiefly in light alloy. Most production versions are powered by a variant of the Lycoming O-540 flat-four air-cooled piston engine, though a relatively small number are BN-2T Turbine Islanders, with two 400shp Allison 250-B17C/F turboprops.

The airframe is notably straightforward, with a box-section fuselage of conventional semi-monocoque form built up around bulkheads, to which longerons and stringers are attached, and then skinned with external plating that bears a portion of the load. The finishing favours simplicity, economy and strength over performance, with mushroom-headed rivets being used throughout and external stiffening plates at points of higher load. Most of the airframe is of L72 aluminium-coated duralumin alloy.



A snug fit for a full passenger complement aboard a BN-2B of Isles of Scilly Skybus, which flies three Islanders. ALAMY

The wing and tailplane are of untapered ‘plank’ form with no dihedral. This dramatically eases manufacture, as all wing and tail ribs are the same, and spars are straight, extruded members with minimal machining required. Both are effectively single structures from tip to tip. The wing is a two-spar structure with the wing skins effectively forming the base and lid of a span-wide box, conferring immense strength. The section is NACA 23012, in common with many contemporary light aircraft. The wingtips are detachable fibreglass fairings, upswept to provide dihedral effect for greater stability.

The control surfaces are simple. The flaps are electrically operated and can be set in one of three positions for take-off, landing and flight. When deployed, the flap hinges open

Baggage goes aboard an OLT Islander as passengers enter via one of the plentiful cabin doors. KEY

a slot between the surface and the wing to help maintain airflow at low speeds and high angles of attack. The ailerons lack moveable trim tabs, but the starboard aileron has a fixed trim tab that can be adjusted on the ground. The elevator's large trim tab is adjustable from the cockpit. All control surfaces are mass-balanced.

The Islander and Defender are designed and constructed to maximise airframe life. This is achieved through the aircraft being lightly loaded, thanks to the large wing, and strongly constructed. The low stress levels designed into the structure mean fatigue life is effectively infinite. Most of the airframe structure is designed according to 'fail-safe' principles whereby if an element fails, its loads are borne by the neighbouring elements. Corrosion-proofing inside and out is performed during construction, and all components are wet-assembled with special jointing compounds to further reduce the likelihood of corrosion.

The wings contain the two main fuel tanks, immediately outboard of the engine nacelles, which are an integral part of the wing structure. Additional tanks can be fitted in optional detachable wingtips, somewhat larger than the standard components.

The undercarriage is fixed, in the tricycle layout, with long-travel suspension for rough-field operations. In keeping with the rest of the aircraft, components are widely available 'off-the-shelf' items wherever possible; for example the wheels, which are standard Cessna Goodyear units. All six wheels are the same, and in the event of damage to the nosewheel one of the twin mainwheels can be switched to the nose in an emergency.

The interior is simplified by the lack of a centre aisle, made possible by several large external doors allowing access to each of the five rows of seats from the side. Passengers occupy the parallel-sided forward-mid-section of the fuselage, while luggage goes into the tapering rear fuselage. The bench seats can be easily removed, folded and stowed in the luggage space if more space is needed in the cabin, such as for freight or a casualty on a stretcher. The easily convertible interior means a variety of options are available other than all-passenger or all-freight, being suitable for ambulance, parachute, supply drop or executive roles.

> ***"It is designed to maximise airframe life"***

The standard fit has a single pilot's position, but dual controls can be fitted as an option. The pilot's seat is the same as the passenger seats, with the addition of seatbelts. In the Series 1, it was not adjustable, and the rudder bar had a wide range of adjustment to compensate. For pilots who found the control yoke too far away for comfort, a cushion was recommended. The Series 2 introduced an adjustable seat.

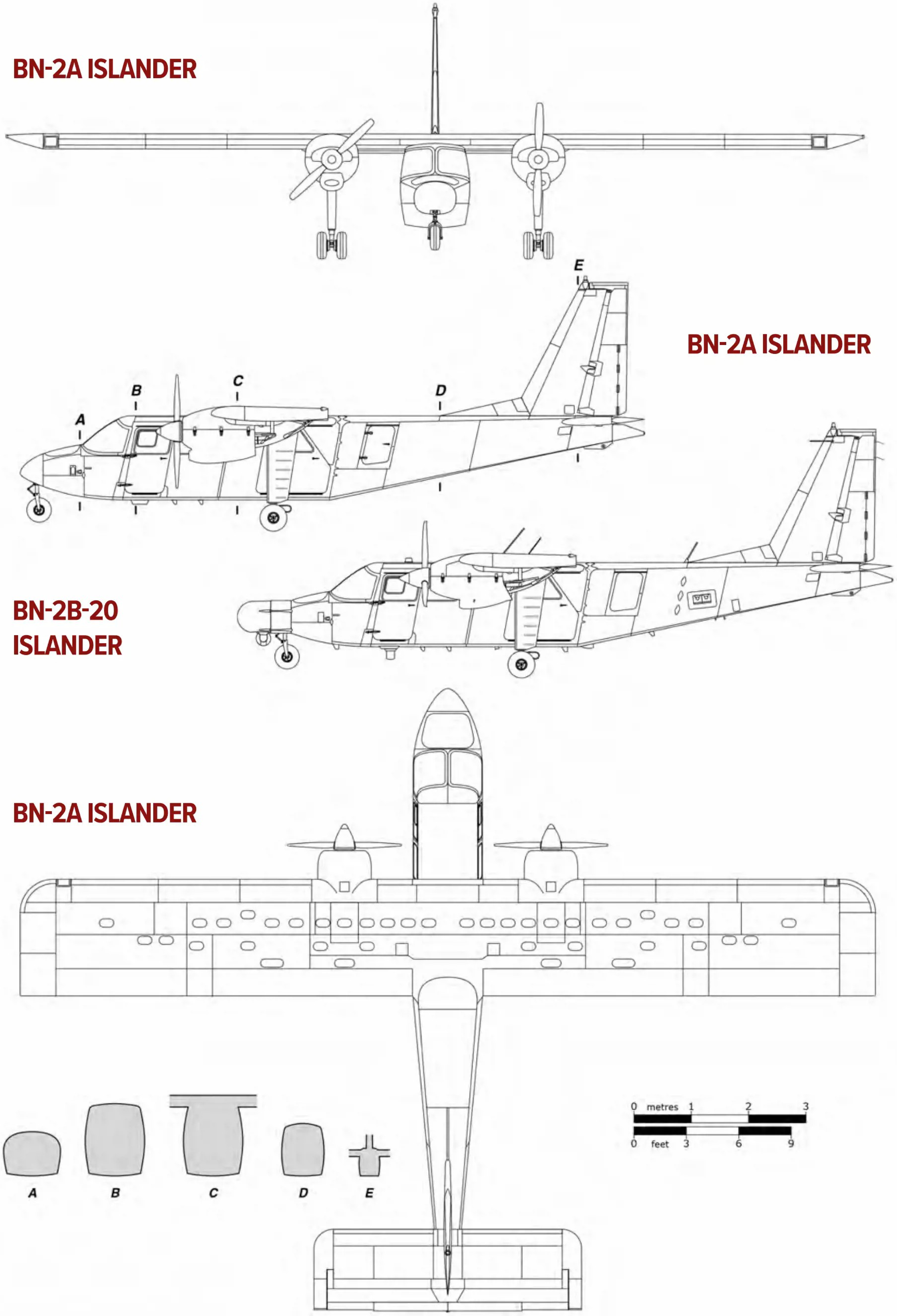
Like the Islander, the military Defender was offered in piston and turbine-engined versions. The Defender could be fitted with four underwing pylons capable of carrying external loads of up to 2,300lb, and configured for various jobs. The maritime variant was equipped with a Bendix/King RDR-1400 search radar, and was suitable for roles such as fisheries patrol, oil rig protection, and search and rescue.

The Defender 4000 represented a more significant change from the stock Islander airframe, with the stronger, 53ft-span wing from the Trislander and a stretched fuselage resulting in an 8,500lb all-up weight. This variant was offered with the Thorn-EMI Skymaster look-up and look-down radar.

B-N currently offers the Islander with modern 'glass' cockpit avionics including the Garmin G600 TXi touch-screen flight display, GWX 75 weather radar, GTN 750 and 650 flight management, GPS, navigation and communication system, and S-TEC 55X autopilot.

DATAFILE **SPECIFICATIONS: BN-2A-26 ISLANDER**

DIMENSIONS	
Length:	35ft 8in (10.86m)
Span:	49ft (14.94m); 53ft (16.15m) with extended wingtips
Height:	13ft 9in (4.18m)
WEIGHTS	
Empty:	3,705lb (1,680kg); BN-2T: 4,040lb (1,832kg)
Maximum:	6,600lb (2,994kg); BN-2T: 7,000lb (3,175kg)
POWERPLANTS	
Two Lycoming O-540E six-cylinder air-cooled piston engines, 260hp each; BN-2T: two GM Allison Gas Turbine Division Model 250-B17C/F turboprops, 400shp each	
PERFORMANCE	
Maximum speed:	168mph (270km/h); BN-2T: 195mph (314km/h)
Stalling speed:	54mph (87km/h)
Landing distance:	459ft (140m); BN-2T: 747ft (228m)
Climb rate:	860ft (262m) per minute; BN-2T: 1,050ft (320m) per minute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IN SERVICE

In all sorts of civil, military and other roles the world over, the Islander family has proved itself

BN-2A G-AXWR, pictured in Jersey during the summer of 1987, was in the Aurigny fleet from 1970-89. ADRIAN M. BALCH

The third Islander built, G-AVCN, was delivered to Glos Air in August 1967, making it the first to go into commercial service. The airline operated various small aircraft between Staverton and Ireland, and G-AVCN was originally intended for this route when it was received in August 1967. However, when the troubled British United Airways withdrew from the Alderney to Guernsey service for 1968, a 50-year association between Alderney and Britten-Norman aircraft began.

With the end of the air link, residents of the northernmost of the Channel Islands were confronted with their only off-season contact with the other islands being a twice-weekly boat. The air service had been vital for mail, news, business and medical trips, and was less affected by weather. The States of Alderney, the island's government, approached Glos Air owner Derrick Bailey, who had a home on Alderney, in the hope he could fill the breach. Bailey agreed and set up a partner airline, Aurigny Air Services — Aurigny being the Norman French for Alderney — in February 1968. The States were unable to subsidise the operation, so Aurigny would have to do what no airline had successfully managed since Alderney's airport opened in 1935: run a commercially viable service. The new Islander proved critical to its success.

On 1 March 1968, G-AVCN made the inaugural commercial flight between Alderney and Guernsey, with a full complement of passengers. The Islander proved perfect for the island-connecting service, and in the first year of operation Aurigny claimed some 45,000 passengers had flown on it. That was just the beginning. By the early 1970s, the airline was carrying 180,000 people a year on its

Loganair BN-2B-26 G-BLDV gets airborne from Papa Westray in April 2023, en route to Westray — the world's shortest scheduled commercial airline service.
DANIEL NICHOLSON/AIRTEAMIMAGES.COM

inter-island network and connecting flights with France and England. A second Islander, G-AVUB, was quickly leased, and within the first month of operations two more, G-AWBY and G-AWBZ, were acquired.

Aurigny continued its pioneering use of Britten-Norman aircraft in 1971, when it became the first operator of the Islander-derived three-engine BN-2A MkIII Trislander (the subject of next month's Database). Two years later, it broke 1,000 passengers in a single day. The sheer capacity achieved by Aurigny, with aircraft that could only carry 10 or 17 passengers each, on routes that were frequently affected by bad weather, would not have been possible without the Islander and its younger sibling — aeroplanes capable of very high frequency of flights and rapid turnaround, with exceptional mechanical reliability. There were days when load factors exceeded 90 per cent.

> *“The BN-2 was cheap to buy and operate”*

G-AVCN only operated with Aurigny for a few years before being returned to B-N, later being sold to Air Sport in the French West Indies. Aurigny's fleet in the early 1970s consisted of three Islanders and two Trislanders, but eventually the larger aircraft supplanted its older sibling completely.

Aurigny's example was an inspiration much further afield. One case was that of Tom Corwin, who founded Viking Airways in the late 1960s serving Block Island off New England, initially in aircraft such as the Piper Aztec and single-engined Cessnas. These were not entirely suitable. The Aztec had slightly higher operating costs per hour than the Islander and half the passenger capacity. In 1969, Corwin ordered two Islanders, and then two more. Viking declared, “the Islanders are particularly suited to its air taxi and charter operations for several reasons”, adding that the aircraft's short take-off and landing ability “enables Viking to use these aircraft at major metropolitan air terminals equipped with STOL runways (such as La Guardia, New York, and Logan International, Boston) with a minimum of time spent unproductively holding while airborne, waiting for clearance to land, and with a minimum of turnaround time.”

Orders flooded in. Even before the aircraft went into service, B-N had commitments for more than 100. The fifth example went to the Jonas Aircraft and Arms Company in New York, which quickly secured a deal to distribute the type in the US, with an initial purchase of 20. Other early sales went to Aertirrena in Italy, Transgabon and Air Gabon in Gabon, Aerovias del Valle in Costa Rica, Island Airways in Australia, OLT Ostfriesische Lufttransport in Germany, and Aerial Tours in Papua New Guinea. As well as passenger aircraft, in 1968 the Thai Ministry of Agriculture and BKS Survey Flights in Yorkshire purchased BN-2s fitted with a camera in the floor. The Islander was cheap to buy, cheap to operate, reliable and effective for small, short-sector, so-called ‘third-level’ or commuter airlines.

But despite the typical nature of the BN-2's service being distinctly short-haul in nature, its robustness and economy made it capable of lengthy ferry flights. With no passengers and fuel tanks full, trans-Atlantic ferries could be achieved without difficulty. Many aircraft destined for the US, South America or Caribbean have been flown across the Atlantic, via the Faeroes, Iceland and Greenland. Range with a full cabin of 10 passengers and their luggage was around 170 miles, while five passengers and a small amount of baggage could be carried over 800 miles. The Islander was by its nature slower than most other twins of similar power, but it was still able to cruise at 134kt (154mph) at 67 per cent power with a full passenger load.

Despite various problems at the business end, the sale and operation of Islanders continued. It was, after all, virtually an ideal aircraft for regular passenger, light freight and mail services between

There is no other aeroplane that could reasonably take on the demands of operating with the Falkland Islands Government Air Service, as illustrated on Carcass Island in 2008 by BN-2B-26 VP-FBD. ALAMY

VP-AAC
www.ANGUILLAAIRSERVICES.com
ISLANDER CLUB
Islanders are also to be found in more glamorous surroundings, such as Anguilla Air Services' BN-2A-21 VP-AAC at Sint Maarten. ALAMY

Greater Manchester Police inducted Defender 4000 G-GMPB during 2002, when it was photographed, and retained it for 13 years. KEN FIELDING

mainland and islands, between islands in an archipelago, or in areas with poor road and rail connections. As the decades progressed, the Islander was found to be suitable for replacing bush-planes, due to its straightforwardness and STOL performance, and light twins such as the Piper Aztec, through its better capacity on the same engines. It proved adept at fitting into a great number of niche applications. The aircraft's early popularity in locations such as Africa and the Caribbean remained strong.

A decade after the first was sold, 850 Islanders had been built, and the aircraft were in service all over the world. The arrival of the BN-2T in 1980 was followed by the first production Turbine Islander in December 1981, then a sales tour with demonstrator G-OPBN through Europe, the Middle East and Africa.

Modest sales followed, initially at around three units a year, but increasing to 10-15 in 1990. As well as its benefits in power and payload, the BN-2T was useful for countries with poor availability of Avgas, such as the Gulf states. By 2006, B-N had built 72 Turbine Islanders, but scaled back production slightly as expected demand did not materialise.

A typical example of Islander employment was InterIsland Airways of Greece, which acquired one aircraft in 1997, and a second in 1998, for an island-hopping service. InterIsland founder Michael Poulikakos wrote, "1998 was a busy year. The Islander started flying in May and the operation was running well. We would fly five flights a day, ten in weekends and everybody was happy. Passengers found it comfortable for the 30-40 minutes legs, the travel agents were soon adding additional legs, and new destinations."

InterIsland bought a second Islander after its first was put out of action by a crack in one engine, and Poulikakos realised a reliable operation could not depend on a single aircraft — even one as reliable as this. He recalled, "The Islander was reliable and we never missed a flight. We added cargo to our tourist operations, which provided additional flight hours and income. On Fridays we would typically take off at 07.30 full of cargo, seats removed and packed, fly from Athens Ellinikon Airport to Syros Island offloading cargo, then on to Mykonos. [We would] then unpack and reinstall seats, dead head to Naxos, pick up nine passengers for Athens connecting to LTU flights for Germany. From Athens we would pick up nine more for Naxos, remove seats and pack them, take a full cargo load from Mykonos and Syros to Athens. This was only VFR flying, so all week we were praying for good weather on Fridays."

In 2016, the Orkney inter-islands air route run by Loganair reached a remarkable milestone. The operation — famous for the service between Westray and Papa Westray being the shortest scheduled flight in the world, lasting just 90 seconds — was active from 1967, the vast majority of flights being with Islanders. October 2016 saw it carrying its one millionth passenger.

After it was announced that production was returning to Bembridge in 2023, the first new aircraft was destined for the Falkland Islands. Starting in October 1979, the Falkland Islands Government Aviation Service (FIGAS) has been a long-standing operator of the Islander, and it ordered four new BN-2B-26s during November 2024. It reinforces the widespread view that the best replacement for an Islander is another Islander.

> **“It proved adept at fitting many niches”**

Both the type's undiminished popularity and the astonishing longevity of its airframe was demonstrated in 2023 when the charter airline JAGS Aviation of Guyana added to its existing fleet of two Islanders by purchasing G-ITTE following a full rebuild. G-ITTE was a Romania-built aircraft originally completed in August 1974! As well as an extensive structural refurbishment, it was upgraded to the latest avionics as installed on new-builds.

While one of JAGS Aviation's existing Islanders was the relatively young 8R-GBK, built in 1983, its third was even older than G-ITTE — 8R-GGT, built in 1971 at Gosselies. This aircraft's long and colourful career involved first going to Israel, operating with Kanaf-Arkia until 1981, then with Alderney Air Ferries as G-BCEN until 1986, after which Air Atlantique acquired it for its Department of Transport pollution control contract. The aircraft subsequently went to HM Coastguard in the mid-1990s, wearing the distinctive red and white livery for 20 years until it was sold to STA Travel, then operated in the Falklands for a few years before returning to B-N for rebuild. It is by no means unique in the length and variety of its service.

Special missions

The good qualities of the Islander have made it highly suitable for many utility tasks in addition to its airline service. In some respects, aspects that were drawbacks in passenger use, such as the aircraft's low speed, proved to be a boon in other fields.

In the early 1980s, the UK Ministry of Agriculture, Fisheries and Food (MAFF) was considering the practicality

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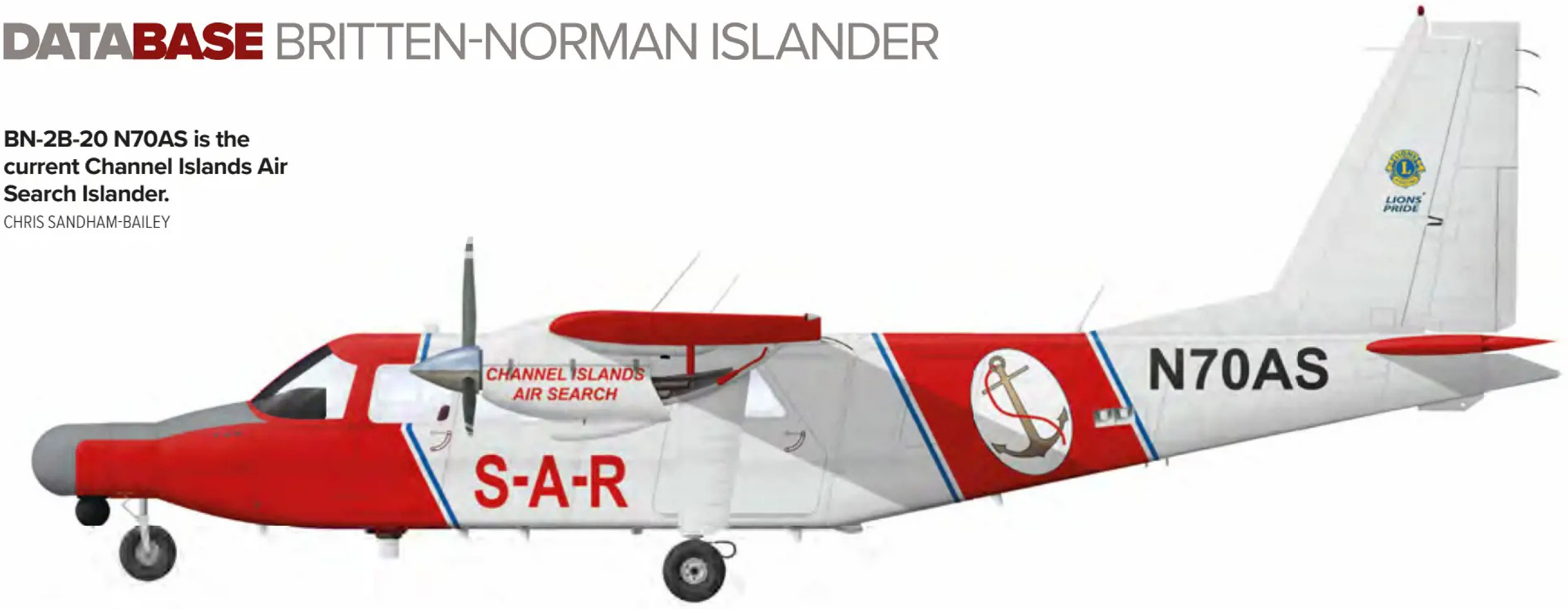


BN-2B-20 N70AS is the current Channel Islands Air Search Islander. CHRIS SANDHAM-BAILEY

of aerial surveillance, so B-N loaned the BN-2T demonstrator G-OPBN for evaluation. The aircraft was adept at cruising at 500ft for long periods, and the ministry purchased one, appropriately registered G-MAFF, to be operated by Flight Refuelling.

The Islander has proved effective as a search and rescue platform with services such as Channel Islands Air Search. This is a voluntary operation in the Channel Islands region based at Guernsey Airport, working alongside helicopters and boats to locate mariners in distress and direct help to them.

❖

Resisting the general switch to helicopters, the BN-2 has gained a following in the world of policing. Its ability to fly at low speed, long loiter time, capacity, all-round visibility and robustness make it ideal for the typical aerial police work of pursuit, surveillance and tracking, as well as being much cheaper to operate than helicopters. Police forces have operated both piston and turbine Islanders, and still do so. The higher operating costs of the Turbine Islander are balanced by its much lower noise levels.

A long-standing user of the Islander and Defender in policing was the Hampshire Police Authority Air Support Unit (HPASU), which in 1990 was operating the Edgley Optica but struggling with serviceability. The unit trialled B-N demonstrator G-TWOB in May that year, and the following month full operations began. Hampshire Police quickly found that the Islander's twin-engine layout gave it a much greater margin of safety than single-engine types, especially at low altitude, while its ability to carry up to 10 people was useful.

By 1991, the superiority of the Islander over the Optica was apparent, and HPASU ordered one tailored to its requirements. G-HPAA was fitted with an infra-red imaging system in a nose turret and a suite of communications and navigation equipment. HPASU added a gyro-stabilised camera in 1993, and had the aircraft upgraded to Series 20 standard with 300hp turbocharged engines.

HPASU thoroughly demonstrated the benefits of fixed-wing aerial policing with G-HPAA, concluding the Islander could achieve 90 per cent of a helicopter's capability at just a third of the cost. The one drawback was the noise level from the piston engines with the characteristic 'buzz' from their two-blade propellers. In 1999, HPASU acquired a Defender 4000, G-SJCH, with quieter turbines. Bob Ruprecht, the unit manager, stated, "The Defender 4000 is an ideal size for two or three observers, with a good mix of TV, infra-red and photographic sensors and other equipment. It represents a significant enhancement over the piston engined Islander with which we have been very pleased". G-SJCH gave 10 years of service before UK aerial police operations were centralised and HPASU disbanded in 2010.

DATAFILE

KILLING THE BUGS

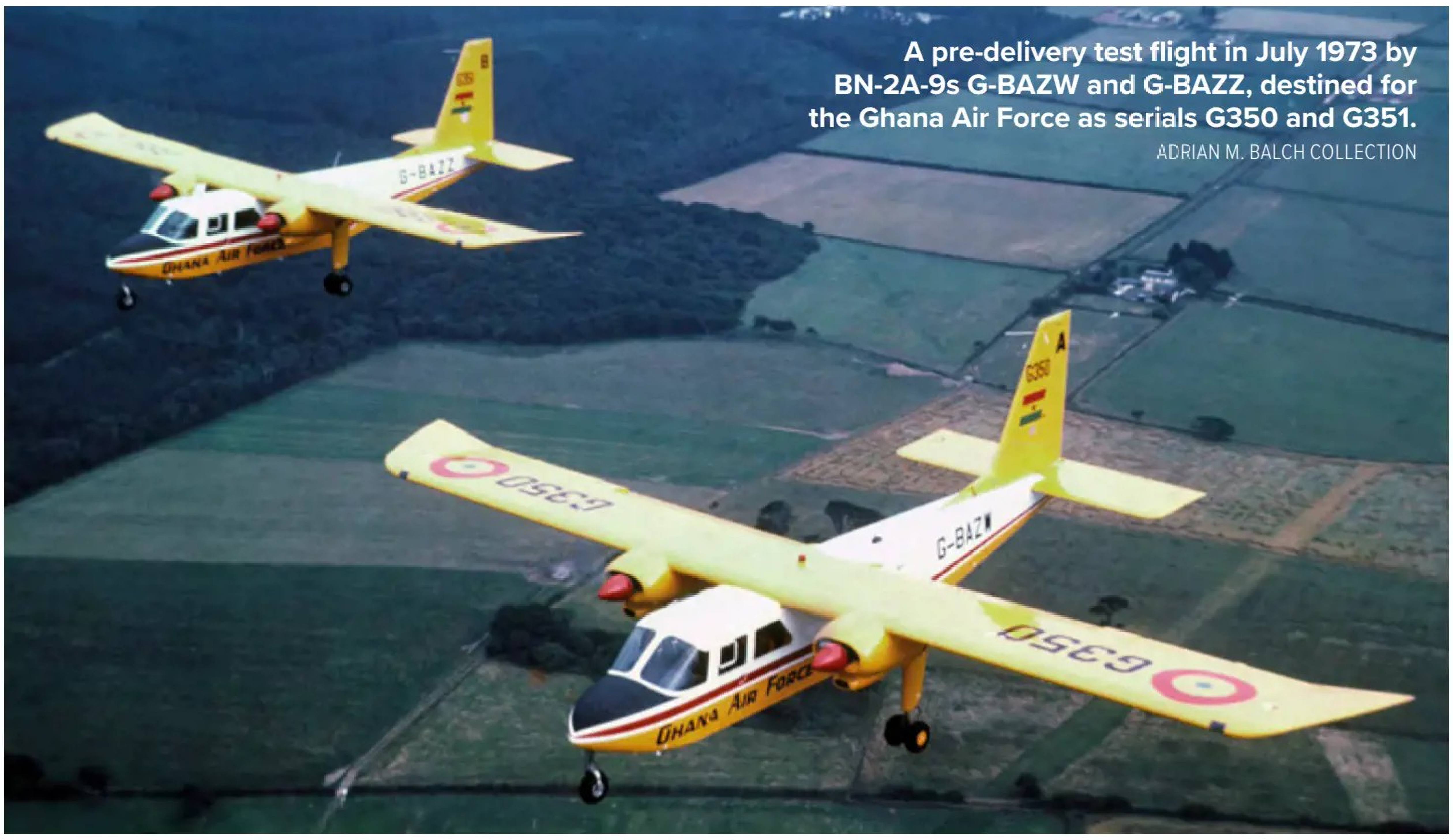
Another popular utility function for the Islander has been pest control, a capability initially demonstrated back in 1970 when an early BN-2A was supplied for locust control purposes in Nairobi, Kenya, using Micronair equipment mounted in the fuselage. Its provision funded by the UK's Ministry of Overseas Development to the tune of £175,000, G-AXHY was re-registered as 5Y-AMG, only to be written off in Addis Ababa during November 1973.

With underwing spray pods fitted, later examples have proved effective at spraying insecticides to help control adult mosquito populations in parts of the world where they can cause serious health problems. After Hampshire Police dispensed with G-HPAA, it was acquired by Calcasieu Parish Mosquito and Rodent Control in Lake Charles, Louisiana. Re-registered as N345CP, the aeroplane operated from Chennault International Airport from 2001-23.

Another operator of an ex-police Islander for mosquito control was the Florida Keys Mosquito Control District which flew a pair of aircraft, one bought from the Royal Oman Police, and which continued to wear the desert camouflage of its former operator. The Islanders gave many years of good service before the Florida Keys operation went to an all-helicopter fleet in 2024.

G-AXHY
G-AXHY

The first Islander to roll off the Romanian production line was BN-2A G-AXHY, built from a British-supplied kit, which was also used for 1970's locust-spraying demonstrations at Northolt. ALAMY


A pre-delivery test flight in July 1973 by BN-2A-9s G-BAZW and G-BAZZ, destined for the Ghana Air Force as serials G350 and G351. ADRIAN M. BALCH COLLECTION

Police forces in many parts of the world have used the Islander with success, examples including the Royal Oman Police, Greater Manchester Police and the Irish Garda Air Support Unit.

Military service

The potential military applications of the Islander were apparent from the outset. If it was possible for the civilian version to supplant bush-planes such as the DHC Otter, then the same was true of a military variant. The simple, tough airframe lent itself to front-line operations, especially in remote areas. The versatility of the family made it suitable for a variety of roles, and the Defender series soon found itself fulfilling multiple functions in air arms and police forces all over the world.

In 1976, the Indian Navy ordered six Defenders for observer training. The first three aircraft were delivered during May, one flown by Lettice Curtis and another by Janet Ferguson, the others arriving towards the end of the year. The Defenders equipped squadron INAS 550 at Cochin (now Kochi), and while their main role was the training they had been acquired for, they diversified into maritime reconnaissance, patrolling trade zones and doing search and rescue, transport and communications work.

> ***“Military uses were clear from the outset”***

The Indian naval air arm purchased additional Defenders and Islanders as the 1970s progressed, and by 1981 it was possible to deploy aircraft to the Andaman and Nicobar Islands territory in the Indian Ocean. A new squadron, INAS 318 ‘Hawks’ was established in 1984, the Defenders later supplemented by Dornier 228s. Operating from a temporary base at Ramnad named INS Rajali-II during 1987’s Operation ‘Pawan,’ an assault on Tamil separatists in Sri Lanka, the type carried out maritime reconnaissance patrols to help police communication routes into and out of Sri Lanka. Three of INAS 318’s Defenders were seriously damaged during 2005’s floods, necessitating a major rebuild.

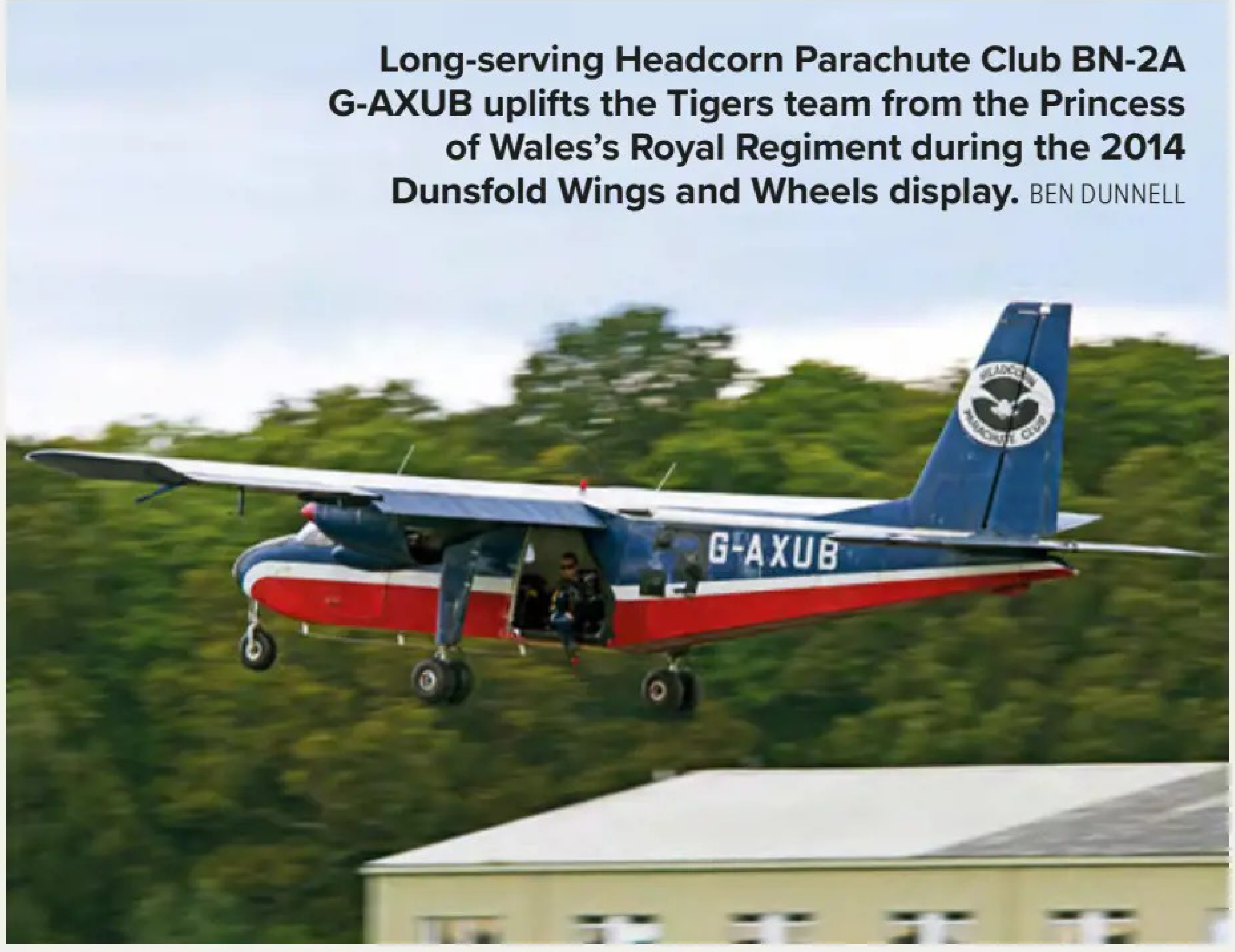
In 1996-97, six Indian Navy Defenders were upgraded to BN-2T status, B-N engineers carrying out the modification in India. Both piston and turbine-engined aircraft were fitted with Bendix-King RDR-1400C search radar in the 1990s. The navy has operated 17 BN-2s, of which four were lost in accidents. Six Defenders were sold on to Myanmar in 2006-07.

DATAFILE

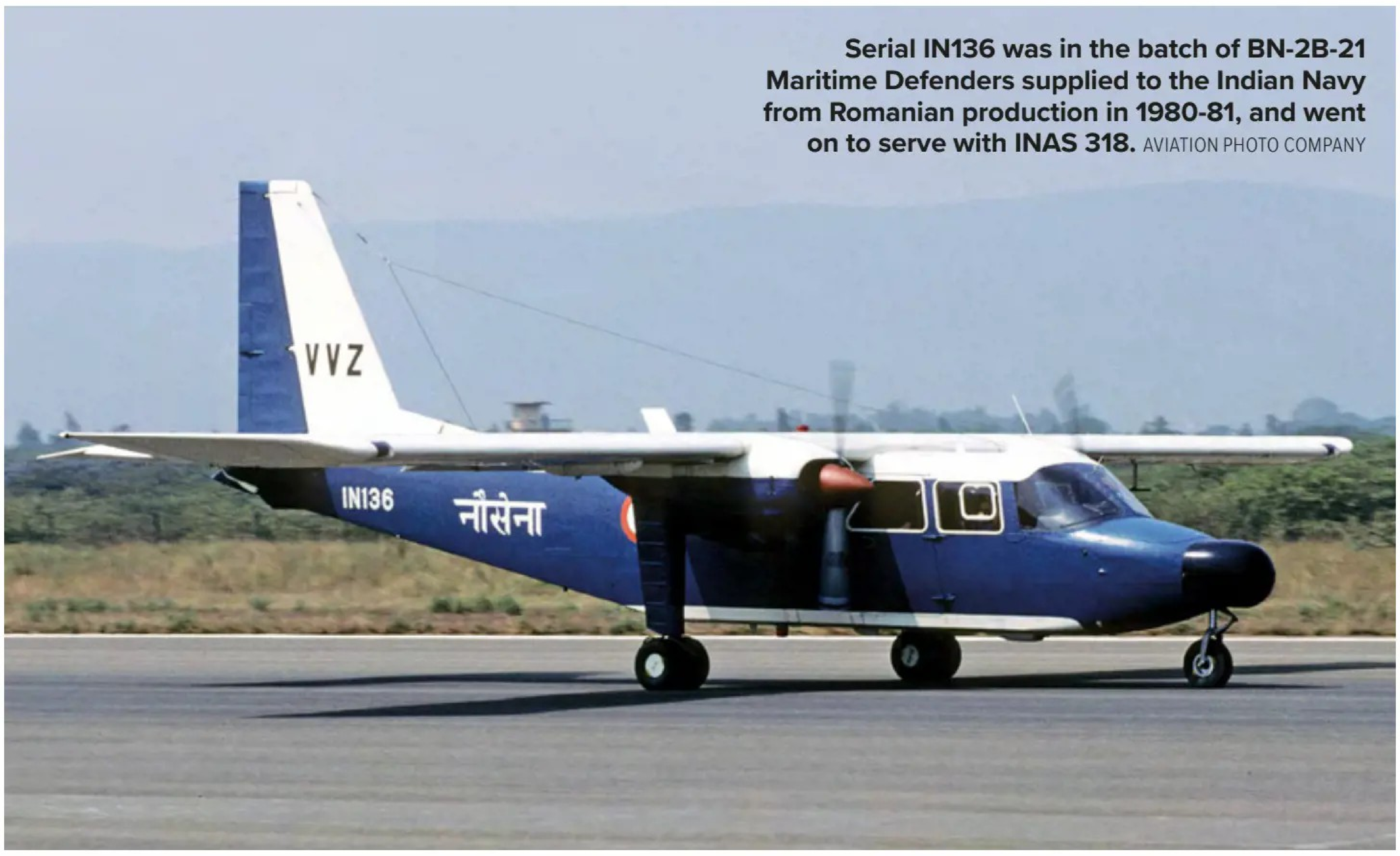
PARACHUTE PLATFORM

The possibilities offered by the Islander for parachuting were obvious from the start, and the first jump was made as early as September 1965 when Tony Austin leapt from prototype G-ATCT. Numerous parachute clubs operated the Islander, appreciating its steadiness, capacity and economy.

The one drawback of the piston-engined Islander was its slow climb, so when the BN-2T became available in the 1980s, with double the climb rate, it was naturally appealing to parachute clubs and for military training. Early deals were agreed with the UK Joint Services Parachute Centre and the Parachute Regiment’s Red Devils team. Another sale was made to the RAF Sport Parachute Association, which trained pupils in free-falling and operated its own display team, the Robins.


Long-serving Headcorn Parachute Club BN-2A G-AXUB uplifts the Tigers team from the Princess of Wales’s Royal Regiment during the 2014 Dunsfold Wings and Wheels display. BEN DUNNELL

It was reported that by 2014 only one piston-engined Islander was still in service as a parachute jump platform, this being G-AXUB — a very early Islander, a Series 2A, first flying in 1969. It served as a passenger aircraft in Nigeria for a spell in the 1970s, before returning to the UK and operating with Headcorn Parachute Club from 1981. When Headcorn finally parted with G-AXUB in 2019 it had 20,000 flying hours, and has continued going strong in the US, where it was sold after a refurbishment.



Serial IN136 was in the batch of BN-2B-21 Maritime Defenders supplied to the Indian Navy from Romanian production in 1980-81, and went on to serve with INAS 318. AVIATION PHOTO COMPANY

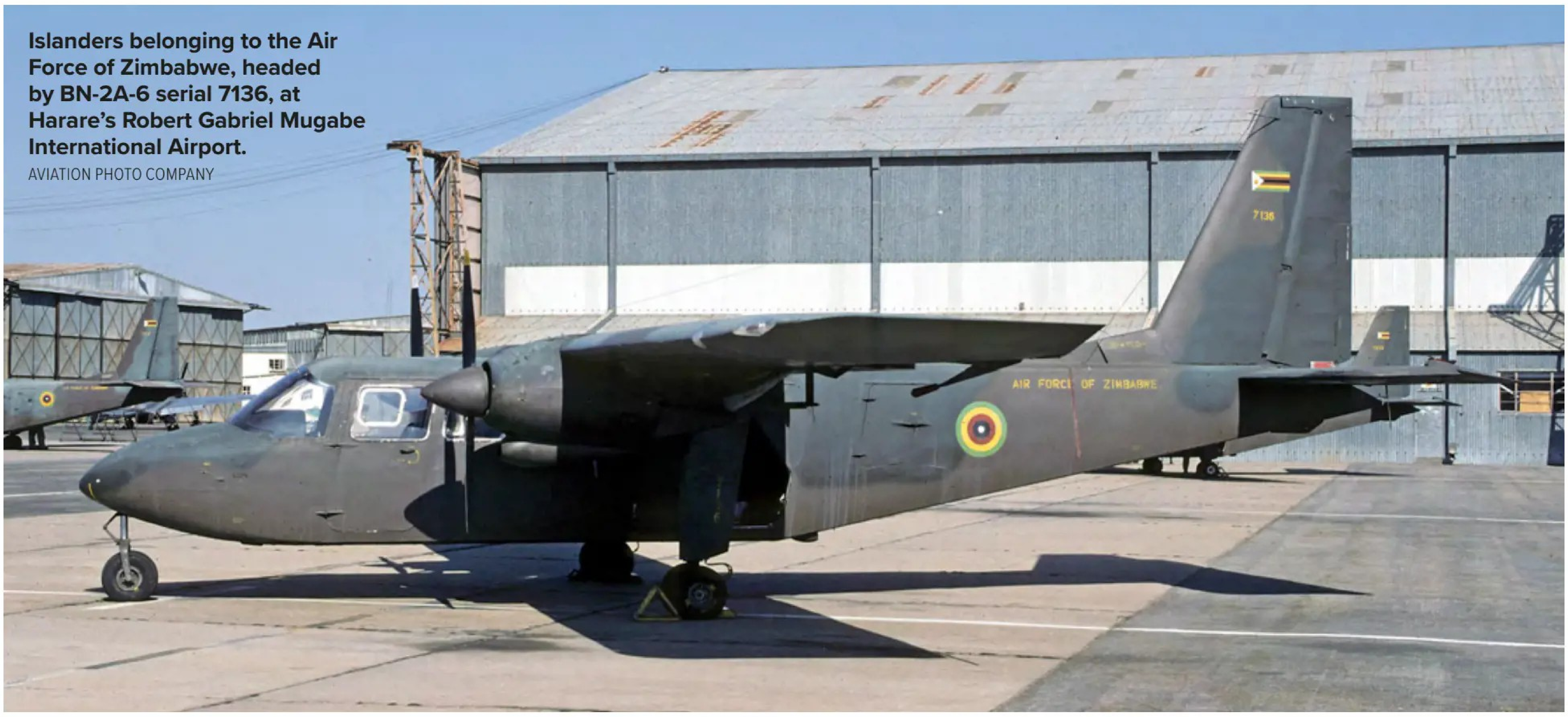
Back in the mid-to-late 1970s, the appearance of several Islanders or Defenders with the military of Rhodesia (now Zimbabwe) caused consternation in the United Nations Security Council. Since the ruling white minority unilaterally declared independence from Britain in 1965, the country had been subject to embargos on arms and other material, especially following a UN resolution in 1968. While precise figures were elusive, it seemed two members of the BN-2 family had arrived in Rhodesia in 1975, while 12-14 more followed in 1978. Their origin was unknown, and the route by which they arrived described as “circuitous”. They were believed to be in use both as transports and for more directly warlike purposes as the illegitimate government attempted to fight off majority-black rebel groups.

A 1980 UNSC report into military aircraft acquisition in contravention of the UN resolution noted, “The Islander is quite versatile. This civilian version of the aircraft can be used for dropping parachutists. There have been unconfirmed reports that it has been used for this purpose in Rhodesia. The aircraft can be easily converted to a military role as the Defender, which can carry a variety of external stores up to 2,300 lbs. The Defender can also be equipped with 68mm SNEB rockets… Its short take-off and landing capability make it ideal for use in guerrilla warfare in a country like Rhodesia-Zimbabwe.”

◆

Another African country that operated the Defender, in very different circumstances to Rhodesia, was Botswana. Ian Kharma, son of the independence leader and then president, Sir Seretse Kharma, visited Bembridge in the mid-1970s to check out as a pilot on the Islander. The country was at that time suffering violent border raids from Rhodesian security services, who were not prepared to respect Botswanan sovereignty in their pursuit of anti-government guerillas. In 1977, the country set up the Botswana Defence Force which Ian Kharma joined on its formation, and later commanded.

The Botswana Defence Force included an Air Wing and the first purchases were three Defenders, possibly encouraged by Kharma’s experience with B-N. The acquisition was far from straightforward. During the delivery flight of one aircraft, the company handling the transit went bankrupt, stranding the Defender in Nigeria and leading to a flurry of panicked correspondence. Eventually, an American pilot was hired to complete the job. Once the Defenders arrived, the BDF was evidently satisfied as it bought four more the following year, and a further five in the 1990s, as well as two Trislanders. Other military operators of the Islander and Defender have included Belgium, Oman, Somalia, Israel, Malta, Antigua and Barbuda, and Mauritius.



Islanders belonging to the Air Force of Zimbabwe, headed by BN-2A-6 serial 7136, at Harare’s Robert Gabriel Mugabe International Airport.
AVIATION PHOTO COMPANY

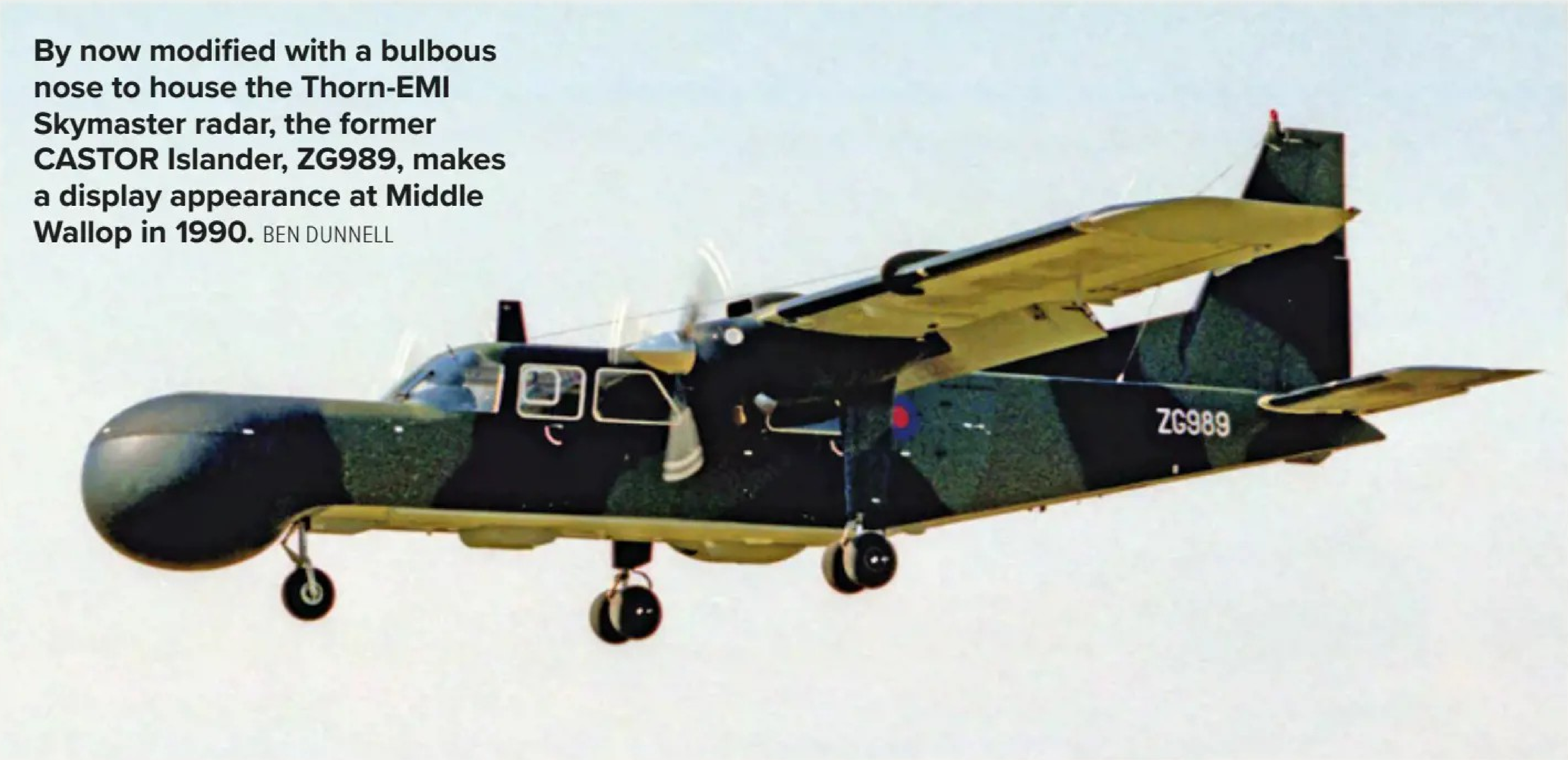
DATAFILE

BRITISH MILITARY SERVICE

It was not just small air arms in developing countries that liked the BN-2, for it found favour in the UK in numerous roles, both with the army and the RAF, in piston and turbine-engined versions. Its functions included transport, communications, parachute training, and intelligence, surveillance, target acquisition and reconnaissance (ISTAR).

Britain was a relative latecomer to military use of the Islander/Defender, and initially adopted a toe-in-the-water approach. The first to be allocated a military serial was BN-2A G-DIVE of the RAF Sport Parachute Association, which was given ZB503 as a 'shadow' identity circa 1984 to allow it to be flown by military pilots without a commercial licence. Later, BN-2T G-WOTG was also ZF444 for the same reason. Another BN-2T, ZF573, carried out Sting Ray torpedo trials.

Fitted with a distinctive 'platypus'-type nose, the turbine-powered G-DLRA started life in 1984 as a testbed for the Corps Airborne Stand-Off Radar (CASTOR) programme — specifically Ferranti's offering — to help ground forces track and isolate targets on the battlefield. But as the CASTOR requirement evolved away from concepts using the BN-2 as a basis, at the end of 1989 G-DLRA became ZG989, modified with a large and bulbous spherical nose fairing similar to that adopted by B-N's AEW Defender testbed G-TEMI, which had also first appeared during 1984. Like G-TEMI, ZG989 was now equipped with the Thorn-EMI Skymaster radar, and it was used by the Ministry of Defence for a selection of trials.



By now modified with a bulbous nose to house the Thorn-EMI Skymaster radar, the former CASTOR Islander, ZG989, makes a display appearance at Middle Wallop in 1990. BEN DUNNELL

The Army Air Corps acquired BN-2Ts in 1989 to replace its de Havilland Canada Beaver AL1s in the counter-terrorist and special forces roles. They initially operated from Middle Wallop with the Advanced Fixed-Wing Flight for training purposes, and from RAF Aldergrove with 1 Flight as part of the Northern Ireland Regiment, mostly undertaking photographic reconnaissance. Despite being the Defender type with underwing hardpoints, they were designated Islander AL1 in service. The AAC's Islanders also saw deployments to the Gulf and peacekeeping operations in Bosnia.

Three Defender 4000s were obtained under a 2003 urgent operational requirement for reconnaissance in Iraq, including the gathering of communications intelligence using sophisticated sensors. They were dubbed Defender AL2s. Five more followed, together with a Defender T3 crew trainer, serving with what was now 651 Squadron.

The RAF took on three aircraft from the early 1990s onwards as the Islander CC2 (ZH536), CC2A (ZF573) and CC2B (ZH537), operating secretively with the Northolt Station Flight. While the details have never been officially confirmed, a significant part of their tasking is widely reported as having involved covert domestic surveillance on behalf of the security services.

On 1 April 2019, the army's remaining special-mission Islanders and Defenders were transferred from the AAC to the RAF, and two years later — the designations prefixed AL, standing for army liaison, having been superseded by R for reconnaissance in line with other RAF aeroplanes — the entire fleet was retired as part of cost-saving measures. B-N purchased the former RAF Defenders, with the intention of refurbishing them and selling them on elsewhere.

Islander AL1 ZG846 on a local sortie from Aldergrove with 651 Squadron, Army Air Corps. CROWN COPYRIGHT

Landing at Aldergrove during 2013 is Defender AL2 ZG995. In later RAF use, the type was known as the Defender R2. CROWN COPYRIGHT

Many an Islander pilot would agree that the aircraft's qualities are exceptional

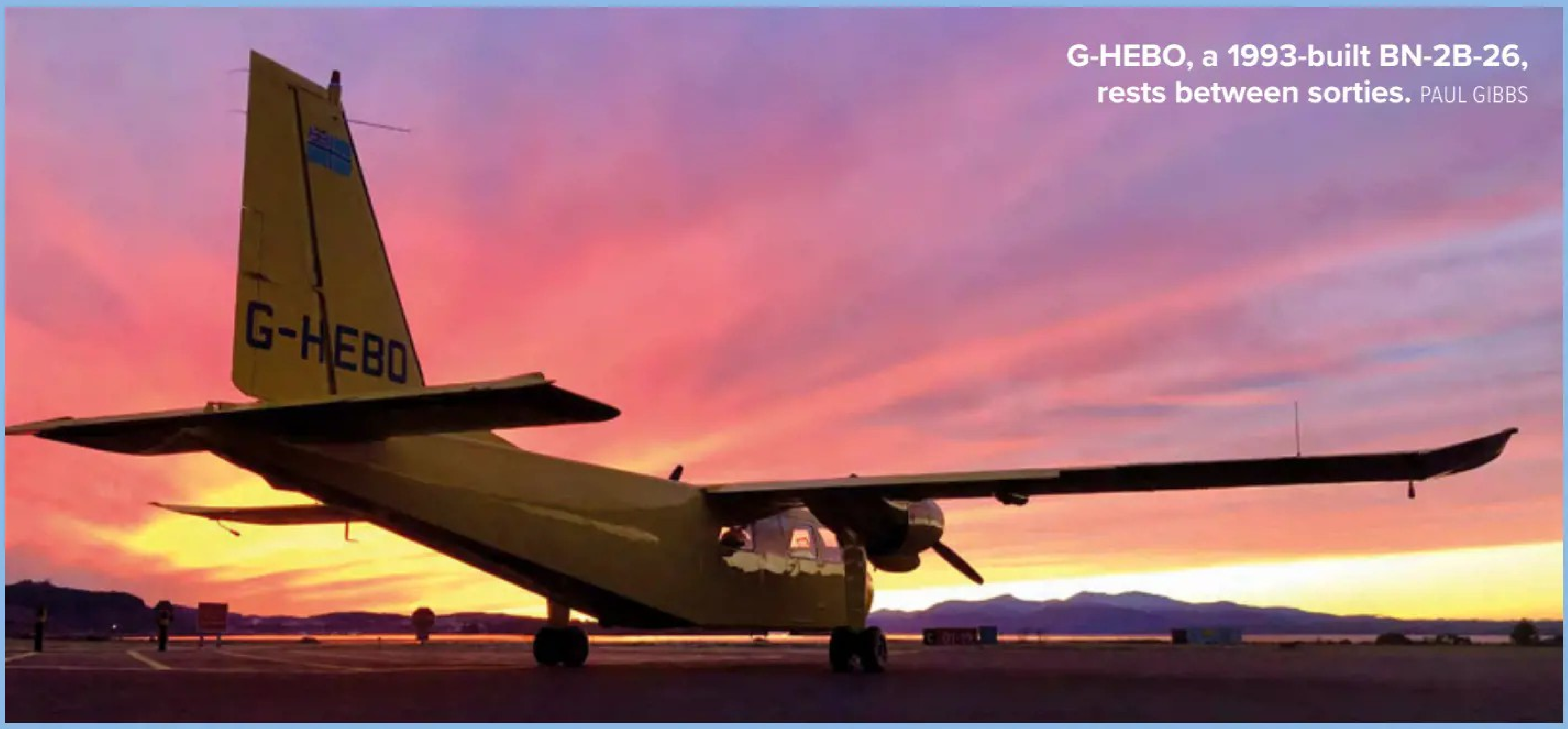
The Islander is as popular with pilots as it is with operators. Much of the success of the aircraft stems from it having good flying qualities despite being simple, even agricultural, in its construction, and the low wing-loading inherent in the concept. In 1968, John Fricker described the handling of the Islander as, "just like a big [Piper] Cub with twin engines and tricycle gear, but if anything [...] easier to fly."

The BN-2T Turbine Islander was in many respects similar, though B-N demonstration pilot Hugh Townend said it was, "rather like going from an underpowered Ford Escort into a Mini Cooper. Vastly improved rates of climb, increased True Air Speed (160 knots) at the preferred cruising altitude of 12,000ft."

Paul Gibbs first flew the Islander nearly 30 years ago, having first seen the type above his childhood home. He recalls, "The skies were seemingly filled with aircraft in the 1980s. I recall seeing Islanders and Trislanders regularly including the Hampshire Police Air Support Unit aircraft. I liked the look of the simple, rugged lines and fixed undercarriage. It appeared to me like a 'Land Rover of the skies'. This was later found to be an accurate assessment...

"I started my commercial flying career on an Islander flying for Air Atlantique on contract to HM Coastguard at Lydd. This would involve flying up and down the English Channel shipping lanes, monitoring any illegal activity. Common examples would be fishing boats actively fishing in the lanes, rather than transiting across them. The Islander was well-suited for the job, being very stable and with the high wing. This allowed easy photography. It was good to get given an aircraft that I had sole

What splendid environments Islander pilots can get to experience, as here on a Hebridean Air Services flight to Colonsay. PAUL GIBBS



G-HEBO, a 1993-built BN-2B-26, rests between sorties. PAUL GIBBS

G-HEBS
Hebridean

Hebridean Air Services BN-2B-26 G-HEBS landing at Coll aerodrome in the Inner Hebrides. ALAMY responsibility for, being the only staff member based there!

"I now fly [the Islander] in the Inner and Outer Hebrides, flying passengers on scheduled services and charters. These are 'lifeline services', often into very short, basic airfields and often carrying people to and from medical appointments or similar. There is also a service provided to carry the island children to the mainland for their schooling. It is literally their school bus.

"It is unique and doesn't really compare to anything else I have flown. It's a very simple and pleasant aircraft to fly, but like all flying machines, you need to be aware of its limitations and weaknesses. It famously will stall before you lose directional control when flying on one engine. This is a fundamentally safe condition and a sign of a good design. Don't stall it and you will be able to maintain directional control when flown accurately. It has very limited performance when flying on one engine though, especially the -26 model. This means you are carrying the weight of the aircraft and all occupants on just 260hp. A draggy aircraft too, with the gear permanently down. Quite a sobering thought. The single-engine stabilisation height is consequently low, especially if it's warm. Careful planning must be made to ensure drift down is safe with regards to minimum safe altitudes. If you are in icing conditions it is worse still!

> *"Very few other aircraft can do what it does"*

"I like the honest and straightforward flying characteristics of the design. It does what it does very well. It is confidence-inspiring when operating into tricky strips in wild weather. The main drawbacks are the limited performance, especially on one engine as mentioned earlier. This is addressed somewhat in the -20 model which has higher-powered engines — 300hp compared to 260hp per side on the -26 variant. The turbine-powered Islander is even better, but has some other drawbacks, especially operating costs.

"As they say for the DC-3, the only replacement is another DC-3. The same could be said of the BN-2. There are very few other aircraft that can do all that it can do, in the same price bracket. In fact, I can't think of one. It feels sort of ageless, certainly not 60 years old. New avionics have helped to operate in the modern airspace-ridden world. Flying single-pilot, it is very useful to have moving map technology, traffic and terrain warning systems and, in some cases, weather radar. The autopilot is also useful, although she is very stable in all axes."

Thanks to Paul Gibbs and Chris Wyman.

DATAFILE

INTO HISTORY

Oldest surviving Islander G-AVCN on display, freshly restored, in the Wight Military and Heritage Museum. TONY DANN

In 2015, the Islander celebrated half a century of flight. By this time the BN-2 was undeniably an historic machine, even as new aeroplanes continued to be sold, and new operators continued to arise. In fact, the historic nature of the Islander and its relatives was recognised as early as 1970, when four school friends formed the BN Historians group to record and document the type's production and service. During November 1974 they produced a book providing the production history of the first 500 Islanders, a milestone that had been reached earlier that year. This was followed by editions in 1977, 1983 and 1996, and production history is now maintained as a constantly updated database.

The preservation of historically significant artefacts relating to the Islander story was addressed from 2000 when the Britten-Norman Aircraft Preservation Society (BNAPS) was formed. The event that prompted this was 1999's discovery of G-AVCN, the third Islander built but the first in airline service, in Puerto Rico. 'Charlie November' was traded in by Aurigny in 1975 and the following year was sold to Air Sport in the French West Indies. Thereafter it operated with several different airlines across the Caribbean, until it became unserviceable and was partially dismantled at San Juan Isla Grande Airport. Peter Graham spotted G-AVCN in 1999; realising its significance, he alerted B-N and enlisted the support of BN Historians. A team from Graham's company Airstream and BN Historians dismantled the airframe in 2000, with technical assistance from B-N and several of its former employees, and it was shipped to Bembridge. BNAPS was formed to facilitate G-AVCN's restoration.

While early progress was good, the pressures of the business meant work on G-AVCN stalled in the 2000s. The airframe was moved to facilities in East Wight in 2009. During 2011, BNAPS decided the restoration should be to static standard. The trustees noted, "The aircraft could be rebuilt to a flying condition provided that sufficient funds, information, parts and labour were available, but only by replacing major elements of the existing structure and parts. In this case only a much smaller percentage of the original would be incorporated into the resulting aircraft. The unique identity would be diluted to a point where its claim to be c/n 003 would lie with its nameplate and its logbook, but no longer through its airframe."

As the restoration of G-AVCN continued, on 13 June 2015 BNAPS ran Islander 50, a celebration of 50 years since the type's maiden flight. At precisely 14.18hrs, half a century to the minute after G-ATCT first took to the air, three Islanders flew in formation over Bembridge Airport. They represented the breadth of the BN-2's career, including G-BEXJ of Channel Islands Air Search, surveillance-equipped Defender G-GMPB, and G-JSAT, B-N's BN-2T demonstrator, wearing a special gold 50th anniversary colour scheme. The first flight was then re-created by George Cormack in his Islander G-BUBP, a 1994-built BN-2B-20.

This particular airframe would soon gain even greater fame, having been filmed in an action sequence for the 2015 James Bond film *Spectre*. It depicted Bond pursuing a convoy of villains in Land Rovers in the Alps, and demonstrated well the Islander's handling, tractability, and ultimately structural strength.

BNAPS finally unveiled the lovingly restored 'Charlie November' on 22 April 2023 at the Wight Military and Heritage Museum, where it remains on display.

Events

DH9 and Bristol F2B together in the blue.
ALL BEN DUNNELL

Shuttleworth Season Premiere Air Show

11 MAY

After many weeks of near-uninterrupted sunshine, the joyful, high-summer glow over Old Warden for the Season Premiere felt vaguely discombobulating. Having recently read Met Office statistics reporting that the spring of 2025 had already enjoyed more sunshine than the entire summer of 2024 — and being slightly non compos mentis due to concussion from a boating accident the previous day — the bedazzled grey matter kept lapsing dizzyingly in and out of a teenage 'endless summer hols nearly over, school again next week' reverie. Once home (I hasten to add, by public transport), this giddy time-slip gelled into more reasoned memories of the last time school beckoned the day following a Shuttleworth show for me, in late September 1979.

No figment of a teenage vintage aviation obsessive's wild imagination could then have dreamed up much of the participation list. For example, as a 16-year-old I knew all about the DH82 Tiger Moth, and was lucky enough to have already flown in one, but had no idea of its namesake monoplane predecessor. Yet on 11 May, here was Steve Jones's DH71 Tiger Moth, G-ECDX, a replica of the high-speed research and racing monoplane, two of which were built in 1927. Neither survived beyond 1940. Although gusty crosswinds prevented 'ECDX taking to the air, this gem is scheduled to star at

G-AAPZ
G-AAIN
G-EBWD

Cirrus-engined Desoutter, Elf and DH60X: what a delight.

Different kinds of aerial spies formate, as Lysander leads Lockheed 12A.

several other Old Warden shows over the course of this season.

No such issues for DH88 Comet G-ACSS, the maiden post-restoration flight of which was eight years away in '79. Jean-Michel Munn was at the helm here, the nowadays almost ever-present stalwart being reason enough to never miss a Shuttleworth event.

Forty-six years ago I remember commentary doyen John Blake comparing the Shuttleworth DH51, G-EBIR, to its similarly proportioned progenitor, the Airco DH9 bomber. I knew — having devoured my copy of Leslie Hunt's *Veteran and Vintage Aircraft Volume 5* many times over — that none existed in the UK, with just one preserved statically in France. I never imagined I would see one at all, let alone in the air. And now, making its second appearance at Old Warden, we had the Historic Aircraft Collection's DH9, E8894, with Clive Denney at the controls, come across from its Duxford base to display alongside Si Davies in the Shuttleworth Bristol F2B, the first time this formation has ever been seen.

Not to be outdone after all these years, the DH51, flown by 'Dodge' Bailey, gave an opposition pairs routine with DH60 G-EBLV, the eighth Moth built. As the seventies ended it was owned by British Aerospace, and was here making its debut flying appearance — Mark Sharp at the controls — since ownership was transferred from BAE Systems to Shuttleworth in 2022.

A prospective Moth rival dating from 1929, Parnall Elf G-AAIN was in the latter stages of restoration back in '79, returning to the air the following April. Since then, this robust, green-and-cream two-seater has become a crowd favourite. In a three-ship with the Elf was the aeroplane that started it all, Richard Shuttleworth's DH60X G-EBWD — which holds the record single-airfield aircraft occupancy accolade at 93 years — and Desoutter I G-AAPZ, acquired by Richard in May 1935 but in deep storage by '79, its subsequent restoration seeing it fly again in January 1998.

And that is just part of the home contingent: visitors included Isabel Rutland making a superb Old Warden debut in P-51D *Marinell*, and Mark Bennett giving the first public display of his Spitfire IX LZ842, the sole Merlin 63-powered example airworthy. Fighter Aviation Engineering's Lockheed 12A G-AFTL — famously used by Sidney Cotton for 'spy flights' just before the outbreak of war in 1939 and surely in the top half-dozen most historic aircraft flying in the UK — was piloted by Gabriel Barton and Ben Cox alongside Scott Butler in a home-grown clandestine ops type, the Shuttleworth Lysander. Bought in 1998 from the defunct Strathallan Collection, in the late 1970s this would have been another dream participant.

So, a tremendous start to the season, complete with a sun-baked cerebral dissolve back through some of what has been achieved, incrementally — and often against the odds — by Shuttleworth over the years. BBC founder Lord Reith's laudable, but nowadays often maligned public service principles, "to inform, educate and entertain", still have deep roots in this exquisite part of Bedfordshire.

Tony Harmsworth

Mark Bennett gave a good account of his Biggin Hill-based Spitfire IX.

Good to see Comanche Fighters' Spitfires AR213 and ML417 flying together.

DENIS J. CALVERT

IWM Duxford VE-Day Flying Day

10 MAY

Somewhat surprisingly, this first Duxford Flying Day of the season is the only event in the 2025 calendar to expressly take the VE-Day 80th anniversary as its overriding theme. It featured — mostly — aircraft with a connection to the end of the European war, though there was also some pure entertainment. To that end, the opening item was Cosmic Wind *Ballerina* flown by Pete Kynsey and Anna Walker's Jungmann, starting with the spritely racer barrel-rolling around the biplane's smoke. The three-ship Turbulent Team gave a spirited display, especially impressive considering the crosswinds.

IWM's Spitfire Ia N3200, with Jon Gowdy at the controls, and Frank Chapman in Hurricane I P3717 engaged in a set-piece with the Aircraft Restoration Company-operated Buchón, an energetic tailchase ending predictably with John Romain 'shot down' and the Buchón trailing smoke. Two Comanche Fighters Spitfires, MkIa AR213 and LFIXe ML417, entered with a close-formation sweep by Brian Smith and Anna Walker around the M11 corner. Anthony Bendkowski underlined the agility of his Piper L-4 and included a pass into wind in which it seemingly stood still — shades of the Twin Pioneer at Farnborough in the 1960s. The final item was Fighter Aviation Engineering's P-47D *Nellie B* and The Fighter Collection's Bearcat, Pete Kynsey and Stu Goldspink putting on the afternoon's highest-octane routine. ***Denis J. Calvert***

Reviews

REVIEWS RATING

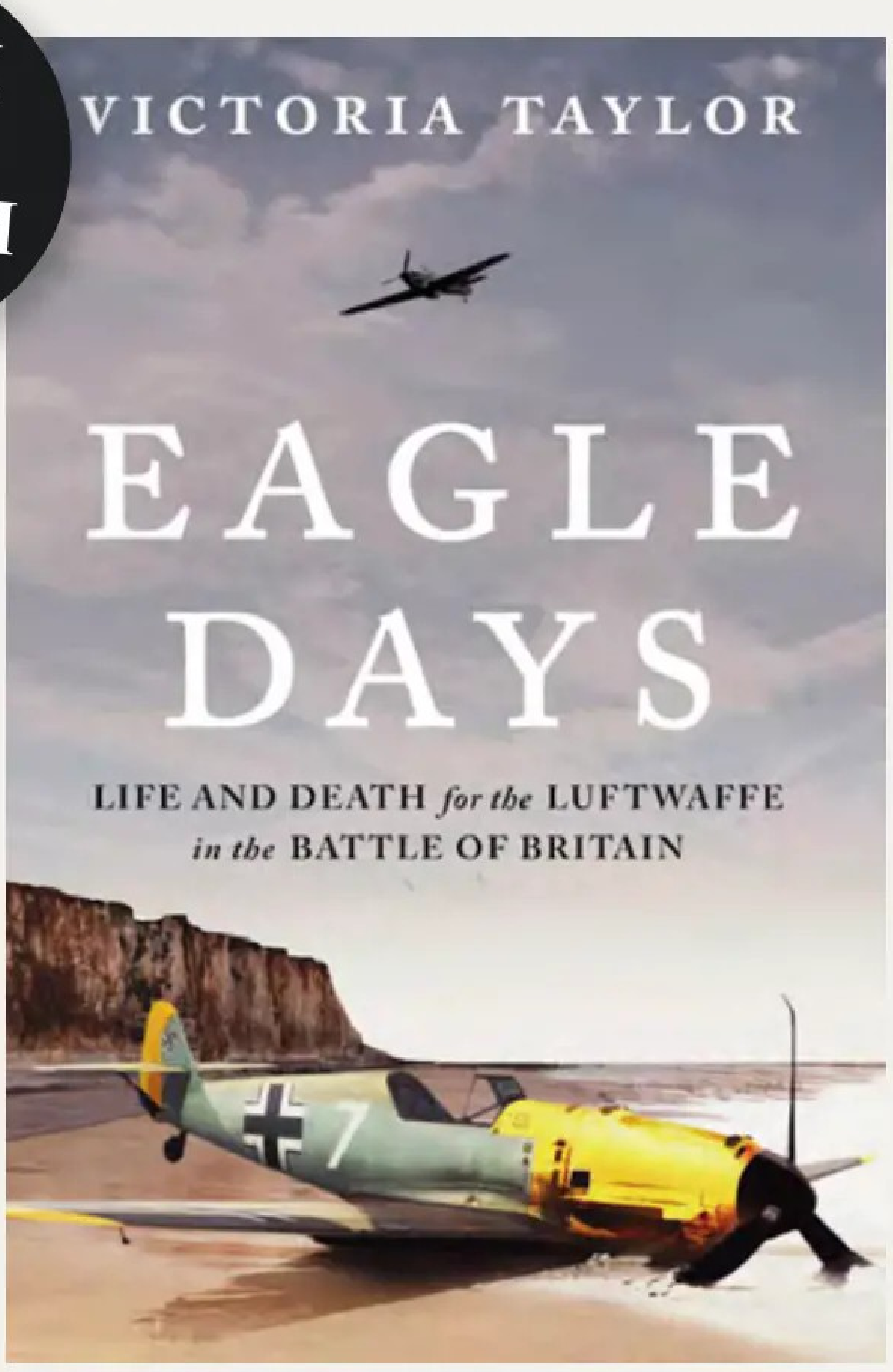
★★★★★ Outstanding
★★★★☆ Excellent
★★★☆☆ Good
★★☆☆☆ Flawed
★☆☆☆☆ Mediocre
Enough said

The latest books for the discerning aviation enthusiast

BOOK of the MONTH

Eagle Days: Life and Death for the Luftwaffe in the Battle of Britain

by Victoria Taylor
published by Bloomsbury Publishing



Has the Luftwaffe's part in the Battle of Britain been ill-served in print? This might seem a strange question, given how many accounts there have been of 1940's aerial combats. But a lot of those have tended to focus either on narratives of what its units and crews did in the Luftschlacht um England, or to go into the German strategy, the tactics and the thinking behind them without exploring much of the human element at either the individual or the collective level. And, perhaps inevitably, there is a tendency for English-language titles to use primarily British sources. These are the gaps Dr Victoria Taylor has sought to fill with *Eagle Days*, in which the underlying influences on the enemy's conduct of the battle are afforded far greater prominence. This has been done with the aid of German archival documents which, it is said, have not hitherto been translated.

The result is an extremely compelling book, very different to anything this reviewer has ever seen on the battle before. While there is much discussion of the military aspects — such as how some German higher-ups were, from the outset, unconfident in the prospects for the success of Unternehmen 'Seelöwe' (Operation 'Sealion') — it is fascinating to have this melded with, for instance, coverage of how the confrontation with Britain was reported back home, and the personal views of both ordinary Germans and those doing the fighting as expressed in correspondence. Perhaps most interestingly and valuably, at least to this reviewer, Taylor tackles the later tendency in some quarters towards portraying the Luftwaffe as "noble adversaries", highlighting many examples that debunk that viewpoint and demonstrate how the air arm should not be separated from the horrors of the regime for which it was fighting.

The author's assessments throughout are fair, balanced, thoroughly referenced and very well-argued. Her writing style, what's more, makes for an excellent read. If you're expecting descriptions of which Bf 109 pilots from which units shot down which Spitfires, this isn't the volume for you. Rather, it's much better and more interesting than that. ***Ben Dunnell***

ISBN 978-1-8045499-9-5; 9.5 x 6.3in hardback; 415 pages, illustrated; £25.00
★★★★

Spitfire Heaven — Hurricane Hell

by Martin W. Bowman
published by Air World

SPITFIRE HEAVEN HURRICANE HELL
MALTA'S BATTLE FOR SURVIVAL IN WW2 BY THOSE WHO WERE THERE
MARTIN W. BOWMAN

With an intriguing and even enigmatic title, this is a very readable account of the World War Two air defence of the island of Malta, which involved not just RAF pilots but others from the Commonwealth and the USA. Bowman tells the story with the help of 120 first-hand accounts and diary entries, and the text brings to life the incessant pace of operations, the shortages of almost everything and the numerical imbalance between the RAF and the Luftwaffe and Regia Aeronautica. Although the legendary Gladiators took the brunt of early engagements, it was the arrival of Hurricanes and later Spitfires that enabled the RAF to meet the enemy on more equal terms. At the end of 1941 and despite new fighters having been delivered under fire by Royal Navy carriers, RAF strength on Malta amounted to no more than 14 Hurricanes and four Gladiators. In February 1942, the 'boss' of No 249 Squadron gave the AOC the stark message, "Either, Sir, we get Spitfires here within days, not weeks, or we're done. That's it". Fortunately, Spitfires came.

This is a fascinating and emotive story, well told and illustrated with 16 pages of black-and-white photos, decently reproduced. ***Denis J. Calvert***

ISBN 978-1-39903-339-8; 9.5 x 6.4in hardback; 250 pages, illustrated; £29.99
★★★

Luftwaffe Bombers vs British AA Defences: Britain 1940-41

by Donald Nijboer
published by Osprey

LUFTWAFFE BOMBERS VS BRITISH AA DEFENCES
Britain 1940–41
DONALD NIJBOER

Osprey's 'Duel' series provides an "account of machines of war pitted against each other and the combatants who operated them". Many titles in it feature combatants which seem both comparable and equally matched, while others — such as this one — involve dissimilar and not obviously paired opponents; more 'Androcles vs the lion' than 'Spitfire vs Bf 109'. The battlefield is the skies above England in 1940-41, when the guns of Anti-Aircraft Command and the aircraft of Fighter Command together faced the Luftwaffe's aerial onslaught. The theory behind the employment of anti-aircraft weapons is explained and the weaponry examined. A German bomber forced to separate from its formation was more likely to fall prey to RAF fighters, while if the AA fire could force the bombers to fly higher, that would adversely affect their aiming accuracy.

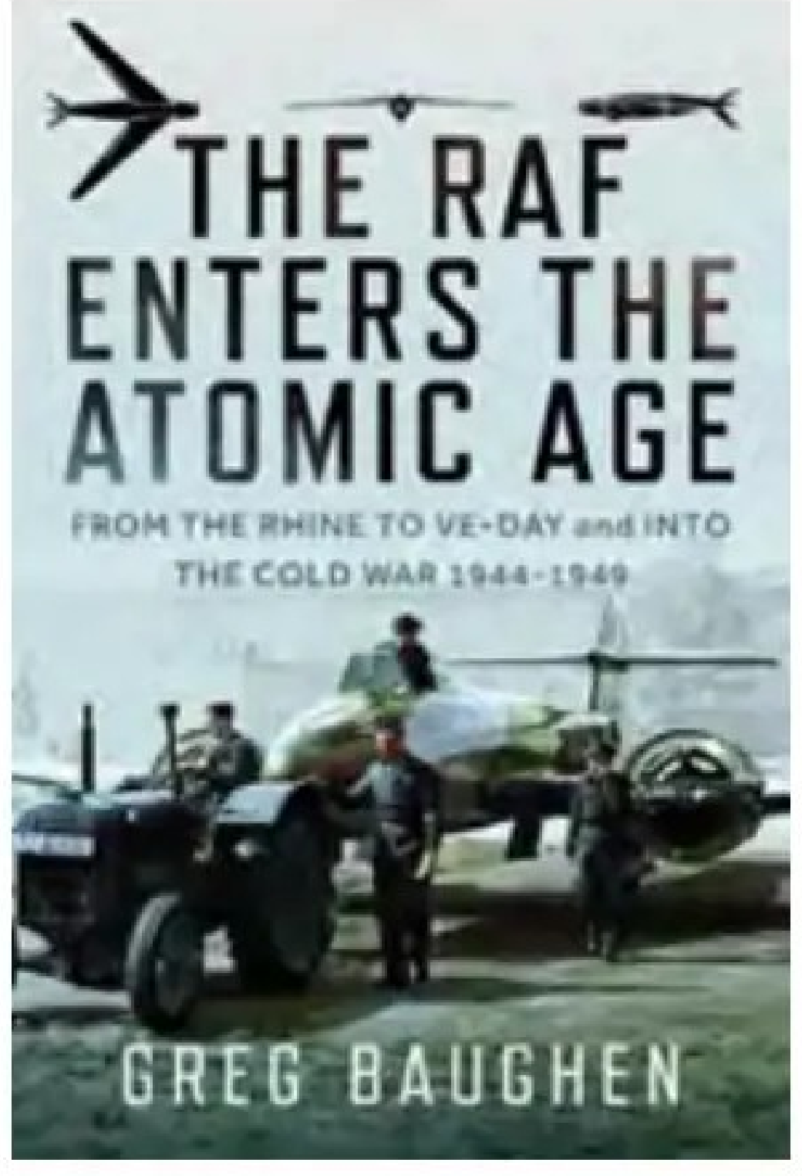
The text is fascinating and covers aspects which have rarely been discussed in print to this level of detail. It is illustrated with maps, diagrams, specifications — of AA weaponry and of Luftwaffe aircraft — well-reproduced black-and-white images and a glorious double-page 'all-action' colour artwork of a Do 17 Z low-level attack on Kenley airfield. Novel, intelligent, recommended. ***DJC***

ISBN 978-1-4728-6576-2; 9.8 x 7.3in
softback; 80 pages, illustrated; £15.99

★★★★

The RAF Enters the Atomic Age

by Greg Baughen
published by
Air World


THE RAF ENTERS THE ATOMIC AGE
FROM THE RHINE TO VE-DAY and INTO THE COLD WAR 1944-1949
GREG BAUGHEN

The subtitle 'From the Rhine to VE-Day and into the Cold War 1944-1949' sums up well the author's aims and the coverage of this title. The introduction notes how unsuccessful the RAF's strategic bombing campaign had been as a war-winner, the German population proving as resilient as the Brits had been to the horrors of mass destruction from the air. Germany's V2 rockets did not change the course of the war, although their advent in 1944 prompted the British Army to draw up plans for similar tactical rocket weapons for battlefield use, while the Royal Navy similarly wanted part of the action. What did change all assumptions was the advent of the atomic bomb. Maybe the bomber could be a war-winning weapon after all?

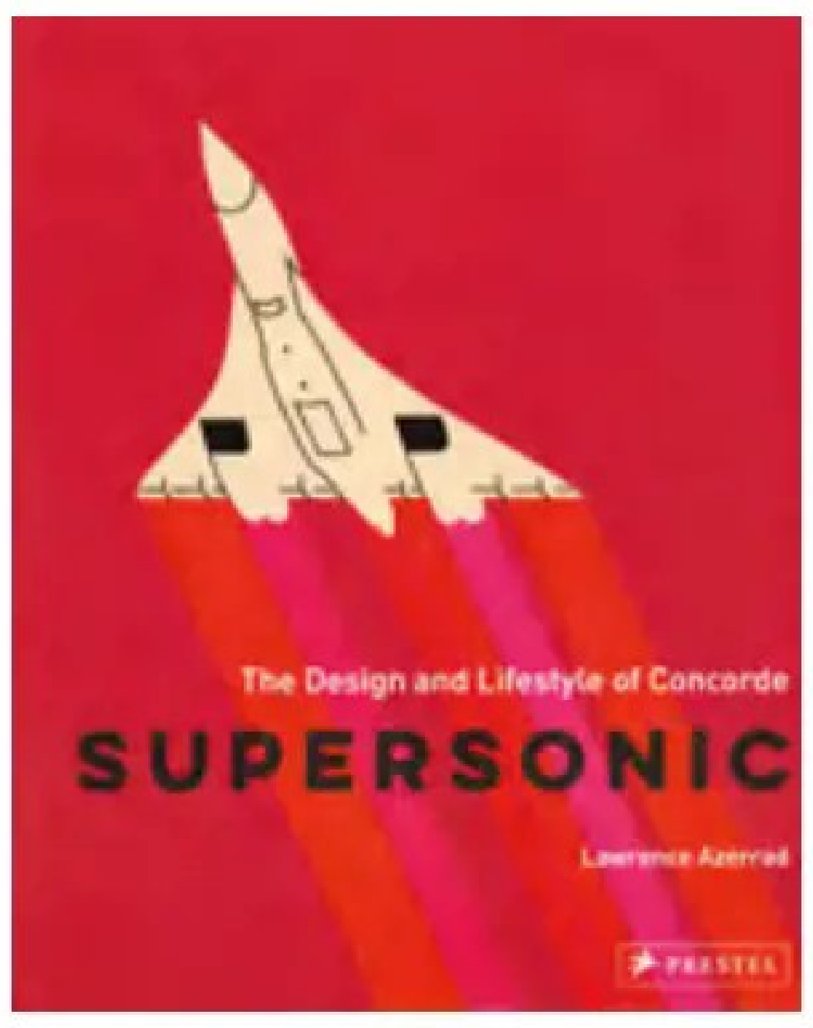
Baughen examines the evolution of British defence policy over the five-year period of the title, and how atomic weapons changed the equation. His text is thought-provoking and well-argued, and the 16-page photo section wide-ranging and nicely reproduced. Students of the ridiculous will revel in the names of British missiles of the time, including Brakemine, Howler, Red Shoes and Spaniel — everything but Blue Banana! ***DJC***

ISBN 978-1-03612-364-2; 9.5 x 6.4in
hardback; 327 pages, illustrated; £29.99

★★★

Supersonic: The Design and Lifestyle of Concorde

by Lawrence Azerrad
published by Prestel



Author Azerrad is "a two-time Grammy Award-winning creative director, author and curator", and this title is his homage to Concorde and a glossy tribute to "the supersonic jet culture, lifestyle and fashion". The cover design is trendy and sets the scene. There are forewords by Clare Vivier — the Franco-American handbag designer, if you didn't recognise the name — and Sir Terence Conran. Both use the word "iconic" within the first paragraph. Text there is, but the book's impact rests or falls on its visual impact. The title pages show a somewhat crude halftone (using newspaper printing 'dots') artist's impression of a Pan Am Concorde. Not a good start. There are photos aplenty, many showing famous passengers but surprisingly few of the aircraft itself. Numerous images are of advertisements featuring Concorde. These are generally well-reproduced, but several exhibit either the fold lines or the page joins of the printed original.

There are some fun quotes. Cindy Crawford recalls taking her "not that big" seat, falling asleep and waking up to find she was sitting next to Mick Jagger. That said, an image book of this kind really needs glossy paper, better selection of photos — some do not take the degree of enlargement to which they've been subjected — and more technical detail to achieve what the author surely intended to achieve. ***DJC***

ISBN 978-3-7913-9362-9; 10.5 x 9.6in
hardback; 192 pages, illustrated; £35.00

★★

Fighters over France 1940

published by MMPBooks

The first six pages of this large-ish (will it fit in my bookcase?) softback provide a good, detailed and succinct summary of the early months of World War Two and the 'Phoney War'. This period of apparent calm was shattered by the German invasion, in May 1940, of France, Belgium and the Netherlands, and soon German forces had reached the Channel coast and were setting themselves up for an invasion of Britain. The text reviews the air assets of the major combatants — Britain, France, Germany and Italy — discussing tactics, giving the front-line strengths of each, and showing aircraft losses in combat or on the ground.

Fighters over France
1940

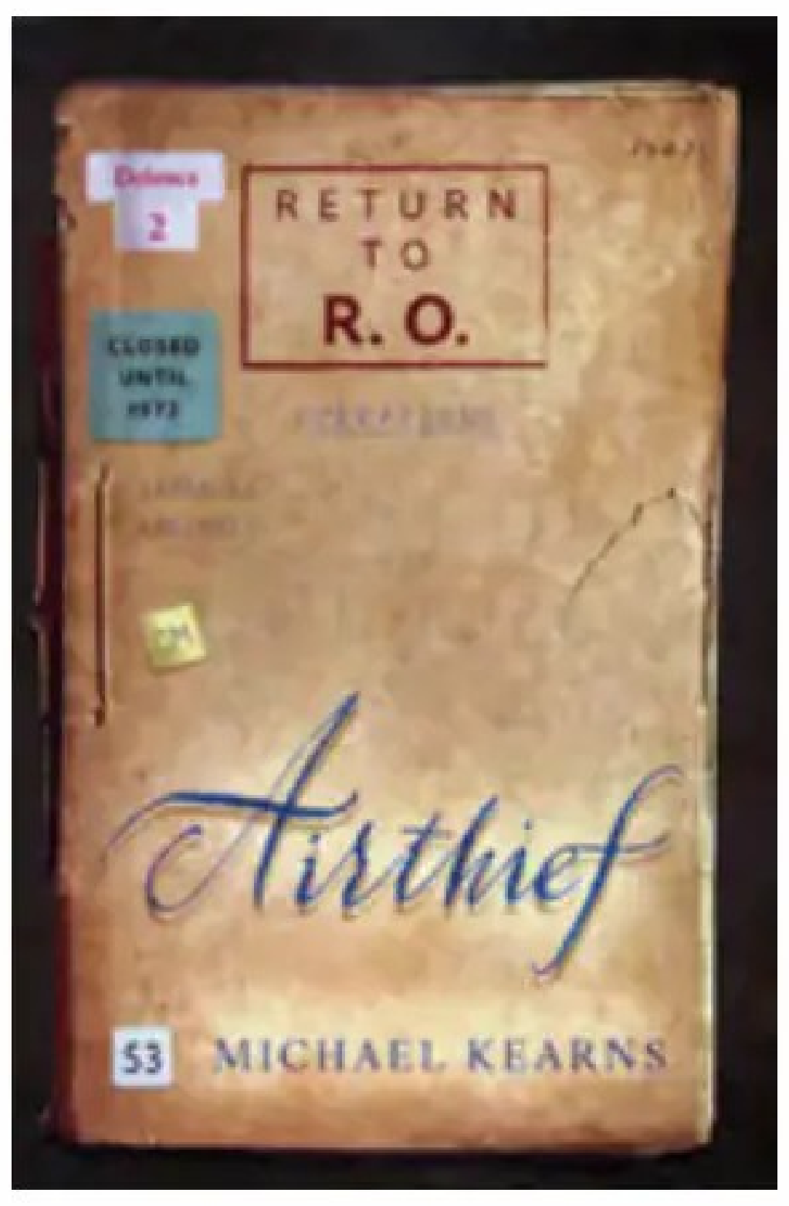
The rest of this volume's pages are given over to colour artwork of the aircraft employed 'over France'. Its large format comes right in allowing colour drawings, some of which are three-views, to be printed large at one or maximum two to a page. The work of several different artists including Richard Caruana, these are of excellent quality and well-reproduced. To tickle the fancy of modellers, page 63 has colour chips for each of the combatant countries' main camouflage colours, these also given the corresponding FS (Federal Standard) reference. ***DJC***

ISBN 978-83-67227-99-5; 11.7 x 8.2in
softback; 72 pages, illustrated; £18.00

★★★

Airthief

by Michael Kearns
published by
Troubador Publishing



Airthief is Michael Kearns's second novel, but his first on an aviation theme. The story is set in 1989, at the time of the fall of the Berlin Wall, and involves the excavation of the remains of Spitfire V 'JK187' and its pilot from a bog in southern England. Several short chapters interweave a wartime German pilot whose grand-daughter is seeking information about his life, former Spitfire test pilot Peter Thorpe trying vainly to recall his wartime escapade with a Focke-Wulf Fw 190 to complete a memoir, and the downed Spitfire pilot. Everything is finally resolved and explained at a meeting of all parties at the IWM in London.

The text has been well-researched as regards aviation-related detail; there is an acknowledgment to John Romain which may be relevant here. The story, once it gets going, moves along at a pace with some exciting action. However, the author has a tendency to over-use adjectives, such as, "triggered an inner alarm in her ragged, seemingly incomplete soul" and to under-use hyphens, for instance "Rolls Royce" and "P51", while references to Thorpe as "the former test pilot" occur rather too frequently. Nevertheless, this a complex story and an ingenious and enjoyable read. ***DJC***

ISBN 978-1-83628-191-7; 7.8 x 5.1in
softback; 266 pages, not *illustrated, £11.99*

★★★

The AUGUST 2025 ISSUE goes on sale in the UK on 10 JULY 2025
Contents subject to change

NEXT MONTH

TIGER FORCE

The RAF's Far East bomber contingent that never was

IRISH AIR CORPS

IRISH FOUGAS

Marvellous Magister jet's career in the Emerald Isle

BEN DUNNELL

DATABASE

BRITTEN-NORMAN TRISLANDER

AEROPLANE

Editorial

Editor: Ben Dunnell
E-mail: ben.dunnell@keypublishing.com

News Editor/Editorial Assistance: Tony Harmsworth
E-mail: tony.harmsworth@keypublishing.com

Regular Contributors: Denis J. Calvert, Richard Crockett, James Kightly, Chris Sandham-Bailey, Steve Slater, Barry Wheeler

Design: Paul Sander, Panda Media
E-mail: paul@panda-media.co.uk

Advertising

Group Advertising Manager: Sam Clark
E-mail: sam.clark@keypublishing.com

Media Sales Executive: Sarah Elmore
E-mail: sarah.elmore@keypublishing.com
Tel: +44 (0)1780 755131 Ext 117

Advertisement Production Manager: Rebecca Antoniades
E-mail: rebecca.antoniades@keypublishing.com

Publisher: Brodie Baxter
Group CEO: Adrian Cox

Subscriptions/Mail Order

PO Box 300, Stamford, Lincs, PE9 1NA, UK
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